NOVEMBER 1960

American
Gas Journal
THE MAGAZINE OF GAS DISTRIBUTION

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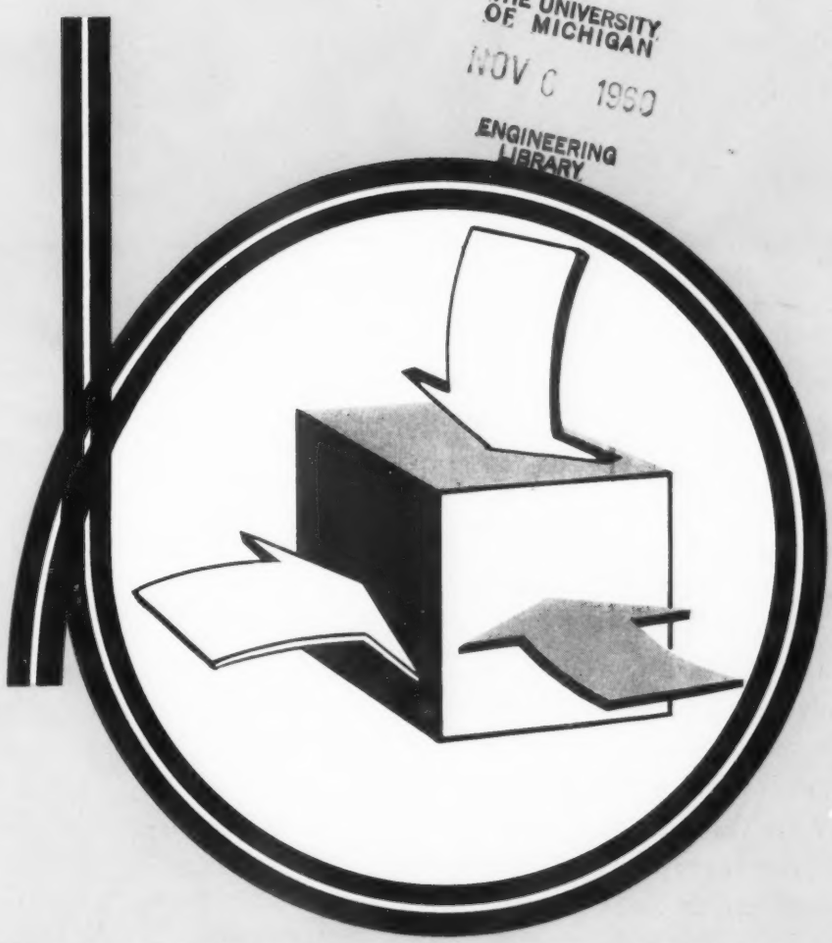

NON-CONVENTIONAL STORAGE OF NATURAL GAS

Now, from the pioneers in temperature compensation...

Once again, American Meter Company research has made a tremendous contribution to the technological progress of the entire Gas Industry. Like every other American Meter advance, the Temperature Compensating Domestic Meters are an outgrowth of the Company's continuous search for *better* ways to serve the industry's needs. In fact, nearly 30 years have passed since American Meter introduced the first temperature compensating device for large Positive Displacement Meters — the Base Volume Index.

The new Temperature Compensator is continuing proof that the Gas Industry can count on American to develop the most modern, accurate measurement equipment. American has pioneered in meter progress since 1836 — and will continue to bring progress through research!

Write for full information.

AMERICAN METER CO. EST. 1836 MEASUREMENT ENGINEERS

AMERICAN® METER COMPANY

INCORPORATED (ESTABLISHED 1836)

GEM GAS EQUIPMENT MANUFACTURERS GROUP MEMBER

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PILOT..
..LIGHTS

New Ideas in Gas Storage

To have or not to have enough gas to meet future peak demands. That's the problem facing the industry today . . . a problem that will grow more acute as the industry expands and more househeating customers are added. To meet peak demands, the industry must have adequate storage facilities. But natural underground reservoirs are in short supply . . . and it becomes necessary that other methods be examined.

Alternative techniques include storage of gas in a liquefied state either belowground or aboveground, absorbed in LPG, adsorbed on activated charcoal or Fullers earth, or in chemical combination as a solid hydrate.

Of all methods studied to date, storage in the liquefied form appears to have the most advantages. Costwise, liquefied natural gas storage is much less than other methods . . . and it is flexible in that it can be used in many areas where other methods would be objectionable. *For complete details, be sure to read the important study beginning on page 20 of this issue.*

Stellar Performer

The little Indian gal pictured here is a star salesman for the gas industry.

Everywhere she goes, she makes friends for her company. The kids love her . . . and employees and customers of her company alike feel a warm, human kinship to the little maid with a gas flame in her hatband. Her name is *Minnegasco,* she lives in Minneapolis, Minnesota, and you can find out more about her and how she "stole the show" at the A.G.A. Convention by turning to page 6.

Next Month

Now you can accurately design low pressure gas piping systems! In the December issue of AMERICAN GAS JOURNAL, a really new, easy-to-use, and strikingly simple system of designing low pressure gas systems makes its debut.

If you can add, subtract, multiply, and divide, you can use this method to correctly design piping for buildings, industrial plants, commercial installations, and other systems where low pressure gas is involved.

American Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

Volume 187 November 1960 Number 12

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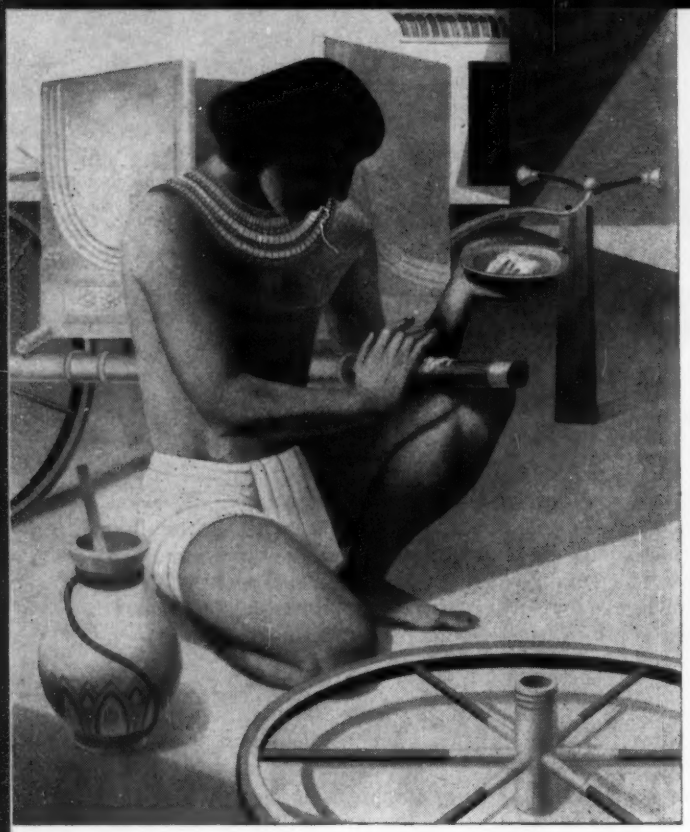
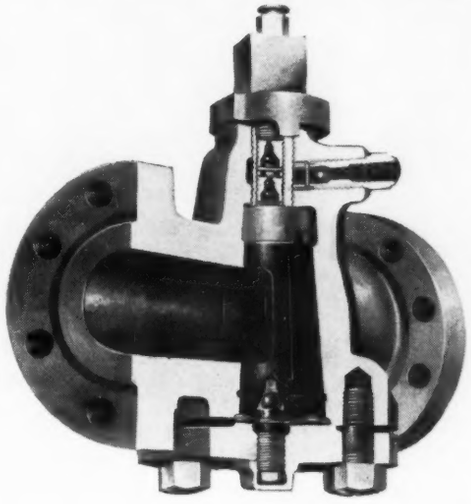


the idea:

Lubrication Makes Things Work Easier, Last Longer

The first recorded use of specially compounded lubricants (a cooked mixture of animal fats and calcium soap) was on chariot wheels in 1400 BC. Today, 34 centuries later, it is still common sense that *any* lubricated mechanism will work easier, last longer and cost less to use than a non-lubricated one.

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom *lubricated* plug valve, metal-to-metal wear is practically eliminated by lubricant. And, the hydraulically compressed lubricant forms a powerful barrier against leakage around the plug. By jacking against the small end of the tapered plug to keep it free, lubricant also assures instant ¼-turn operation.

the benefits:

Longer Valve Life At Lower Cost... Leak Proof Sealing... Instant 1/4-Turn Operation... No Exposed Seating

The 6 million Rockwell-Nordstrom lubricated plug valves now used in a wide variety of industries are translating these benefits into dollars and cents savings day after day. Rockwell-Nordstrom is the most complete line of lubricated plug valves (sizes from ½" to 36"; pressures to 15,000 lb), lubricants and operating accessories. For *practical* help in solving your flow control problems, see your supplier or write: Rockwell Manufacturing Company, Dept. 103L, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International, S. A., Geneva, Switzerland.

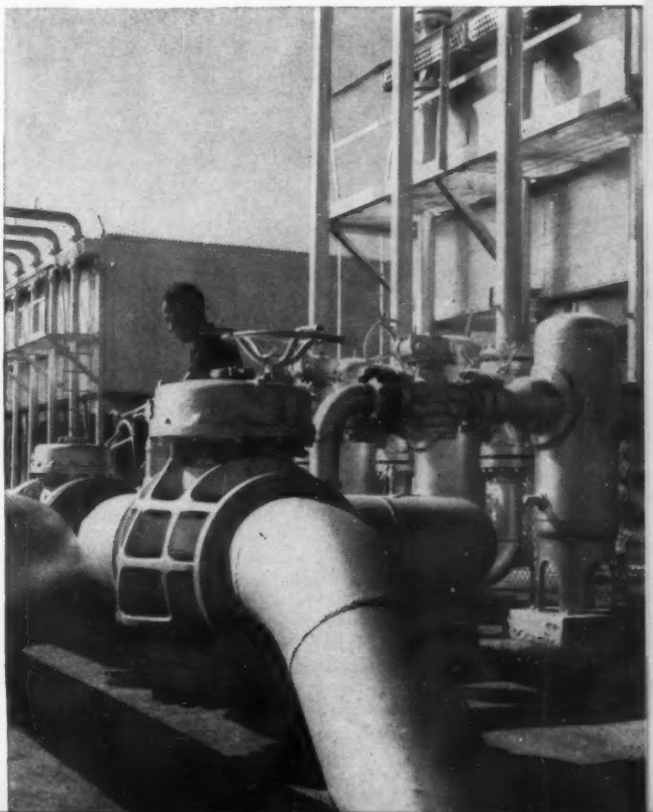
Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

Rockwell-Nordstrom Hypreseal pipeline valves close 2 to 5 times faster yet shut-off positively. Lubrication assures dependability.



NEWSREEL

A.G.A. Presents 17 Merit Awards to Gas Engineers and Executives

American Gas Association's Operating Section Awards of Merit were presented to 17 gas industry executives and operating engineers during A.G.A.'s 42nd annual convention.

The awards, presented by Wister H. Ligon, A.G.A. president, are made annually to individuals for "having faithfully and constructively served the American Gas Industry and made continuous and extensive contributions to further the interests and promote the welfare of the industry and of the public to which it is dedicated."

Receiving the 1960 awards were John V. Adkin, corrosion engineer, Rochester Gas & Electric Corp.; S. A. Bradfield, manager of engineering, Southern California Gas Co.; Erwin C. Brenner, vice president of operations, Milwaukee Gas Light Co.; and Keith J. Burnett, general superintendent, United Gas & Fuel Co. of Hamilton, Ont.

Also Dominic F. Cundari, plant chemical engineer, Public Service Electric & Gas Co.; Robert W. Gilkinson, chief chemist in charge of chemical laboratory, Rochester Gas & Electric Corp.; Clarence B. Glover, operating gas engineer, United Engineers & Constructors, Inc. and Harry A. Grassman, treasurer, Inner-Tite Div., Yara Engineering Corp.

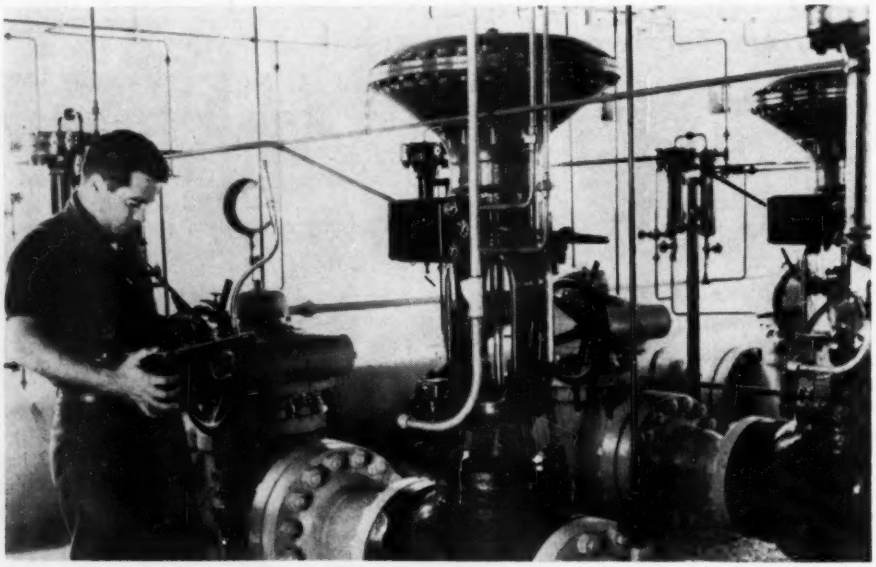
Others receiving A.G.A.'s Award of Merit were George C. Grow, Jr., chief geologist, Eastern Area, Transcontinental Gas Pipe Line Corp.; Marvin F. Hall, consulting gas engineer, Ebasco Services, Inc.; Russel W. Hofsess, vice president in charge of production and supply, Cities Service Gas Co.; and Andrew Lovretin, Jr., superintendent of meters, Public Service Electric & Gas Co.

Also Richard J. Murdy, chief geologist, Consolidated Natural Gas Co.; Frederick Peters, superintendent of gas measurement, New York State Electric & Gas Corp.; Adolph W. Rauth, general meter and laboratory supervisor, Consumers Power Co.; C. S. Spencer, senior chemist, engineering, Michigan Consolidated Gas Co.; and Harold S. Walker, Jr., assistant to the managing director, American Gas Association.

C. P. Xenis Receives A.G.A.'s Distribution Achievement Award — Donated by the American Meter Co., Philadelphia, the award is presented annually to an individual who has made an outstanding contribution to the science and art of gas distribution during the current year, or an outstanding contribution which has gained acceptance during the past five years. The award includes a $1000 cash prize, watch, plaque, and roundtrip transportation to the A.G.A. convention.

In presenting the award President Wister H. Ligon of A.G.A. noted that the Con Ed engineer has made several contributions to the safety, economy, and service of gas distribution systems during the past five years.

"His pioneer work in the development of internal sealing methods for the elimination of leaks in cast iron bell and spigot type joints has been outstanding," Ligon said. These include the so-called "Neverleak" or fill-and-drain method, using a neoprene dispersion, the expanded spring band method, and the fuelling method.



Quiet, please! What causes noise in the regulator station? How did you solve the immediate problem of noise reduction? And how do you design future components to eliminate noise altogether or soften it to a whisper? These are questions that engineers of Columbia Gas System Service Corporation are attempting to answer with aid of a "Soundscope." Utilizing the instrument as both an operating and research tool, engineers make frequent checks of regulator and compressor locations to pinpoint critical sound frequencies responsible for a noise-producing condition. Data gathered will serve as a "blueprint" for future design of noiseless components. Here, an engineer makes an octave band analysis in vicinity of a high pressure control valve at a town border regulator station.

Giant gas air conditioning unit, which will use fuel supplied by Southern Union Gas Co. to provide 307 tons of cooling, is lifted more than 170 ft for installation on 14th floor of the new Bank of New Mexico building in Albuquerque. At the top, a metal plate was slid out from the building to receive the unit, which weighs 28 tons, and convey it to its permanent site.

Minneapolis Gas Company Earns Top Award in Industry Public Relations Competition

Minneapolis Gas Company has been awarded top honors in the fourth annual Public Relations Achievement Awards competition of the American Gas Association.

Wister H. Ligon, Nashville, Tenn., president of A.G.A., told delegates of the Association's 42nd annual convention that the Minneapolis company has been credited with "the year's outstanding contribution to greater understanding of the gas industry and modern gas service" from among 32 entries submitted by U. S. and Canadian companies.

Minneapolis Gas Co.'s winning program, designated for the top award after placing first in the community relations competition, was based on its unique "Minnegasco" project in which a friendly little Indian maiden character became the company's personality symbol.

By using "Minnegasco" in every channel of communication, from customers' bills and school activities to community affairs and stockholder contacts, the company has created a strong new image of service and confidence.

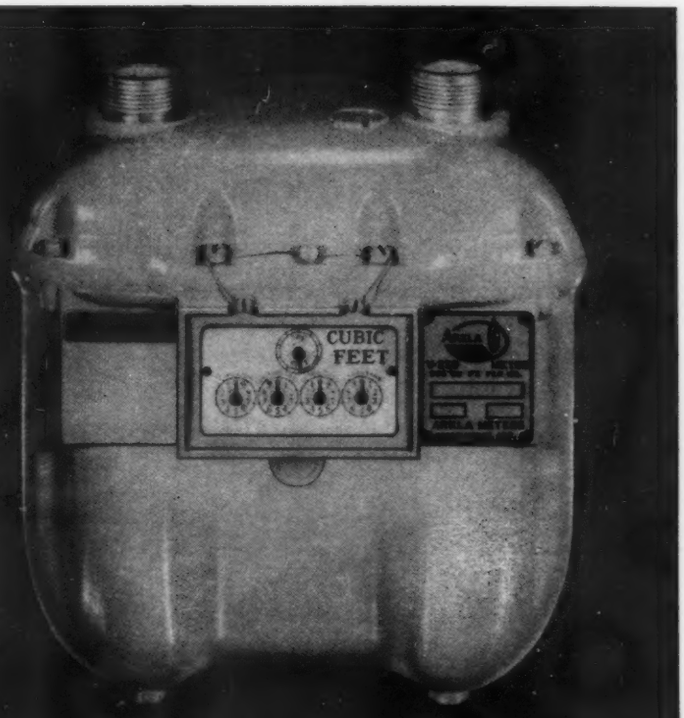
Six other companies also received first-place awards in specific public relations classifications. They were: **Northern Illinois Gas Co.,** Aurora, Ill., school activities; the **Ohio Fuel Gas Co.,** Columbus, Ohio, press relations; **Southern California Gas Co.,** Los Angeles, public safety; **Texas Eastern Transmission Corp.,** Shreveport, La., financial relations; **Virginia Gas Distribution Corp.,** Staunton, Va., customer relations; and **Washington Natural Gas Co.,** Seattle, special projects.

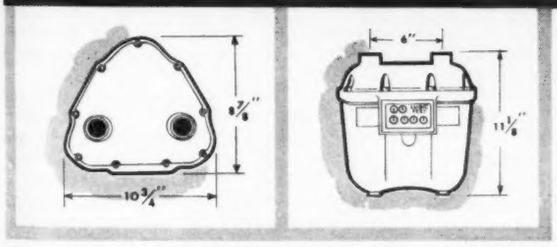
Awards of Excellence were earned by six other companies: Cincinnati Gas & Electric Co., Cincinnati, school activities; **Equitable Gas Co.,** Pittsburgh, press relations; **Michigan Consolidated Gas Co.,** Detroit, community relations; **Oklahoma Natural Gas Co.,** Tulsa, Okla., customer relations; the **Peoples Gas Light and Coke Co.,** Chicago, press relations, and the **Peoples Natural Gas Co.,** Pittsburgh, community relations.

Judges this year were H. Walton Cloke, president, American Public Relations Association; Kenneth Youel, president, Public Relations Society of America, and Dean Hale, editor, American Gas Journal.

V 250

GAS METER





Dimensions: The Arkla V250 Gas Meter weighs less and is smaller than any other 250 cu. ft./hr. gas meter.

A NEW, COMPACT, ACCURATE "CASH REGISTER" FOR THE GAS INDUSTRY!

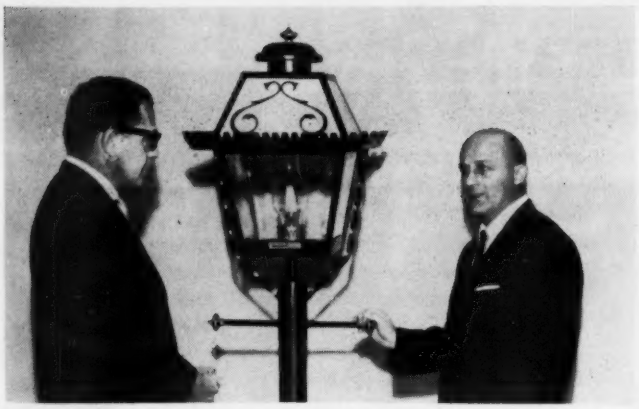
EXCELLENT ENGINEERING AND DESIGN of this gas meter, first of a new, modern line, are evident in its light weight and compactness that make the Arkla V250 Gas Meter easy to install . . . fewer moving parts reduce maintenance . . . accuracy of the Arkla V250 Gas Meter makes it a welcome "cash register" for the gas industry.

Order ARKLA V250 GAS METERS TODAY. *(Other models available soon.) For further information, write or call us, or ask your Arkla-Reynolds Gas Regulator representative.*

ARKLA

WRITE OR CALL:

A Division of Arkla Air Conditioning Corporation



Two "Gaslites" went to Hollywood recently — gaining further national "exposure" for gas—as background props on network television shows. Network TV executives especially requested two "Heritage" model gas lights for use on such shows as "About Faces," "It Could Be You," and "Truth or Consequences." Shown examining one of the two lights before shipment are D. W. Weir, vice president and director of Arkla and executive vice president Arkansas Louisiana Gas Co. at left, and I. Horowitz, president of Universal Manufacturing Co., who processes the steel posts for Arkla's gas lights.

"Golden Gas Lights" were recently presented to executives of Houston Natural Gas Corporation in recognition of the gas company's 10,000th gas light sold. Left to right are Carrington Mason, vice president, and John H. Wimberly, president of Houston Natural Gas Corp., George A. McNeff, president of Falcon Mfg. Co., Inc. Dallas, who made the presentation, and Frank C. Smith, chairman of the H.N.G. board of directors.

'64 World's Fair Building to Air Condition by Gas. The administrative building of the New York 1964-65 World's Fair, scheduled to be the first structure on the fair site, will be air conditioned by gas, and the same fuel will be used for heating and water heating at a majority of exhibits.

John E. Heyke, president of Brooklyn Union Gas Co. and recently named president of Gas, Incorporated, which will handle arrangements for a gas industry exhibit, said all public eating facilities at the fair will be gas-operated.

"The 1939 Fair, where gas was the first industry to break ground as an exhibitor, served as the impetus for one of the greatest decades in our history," Heyke said.

The 1964 Fair, he said, will serve the same purpose. Heyke reported that gas utilities and manufacturers will spend $5,500,000 to plan, build and maintain their exhibit.

Potter Is New A.G.A. President

Lester T. Potter, president of Lone Star Gas Co., Dallas, has been elected president of the American Gas Association.

Delegates to the 42nd annual convention also elected 16 leading gas executives to A.G.A.'s board of directors.

In taking office, Potter becomes the third president of Lone Star Gas to head the association. The late L. B. Denning served as A.G.A. president in 1936, and D. A. Hulcy, currently chairman of the company, was president of the Association in 1951.

Other officers elected were Edward H. Smoker, president of The United Gas Improvement Co., first vice-president; John E. Heyke, president of The Brooklyn Union Gas Co., second vice president; and Charles H. Mann, treasurer of The Columbia Gas System, Inc., treasurer.

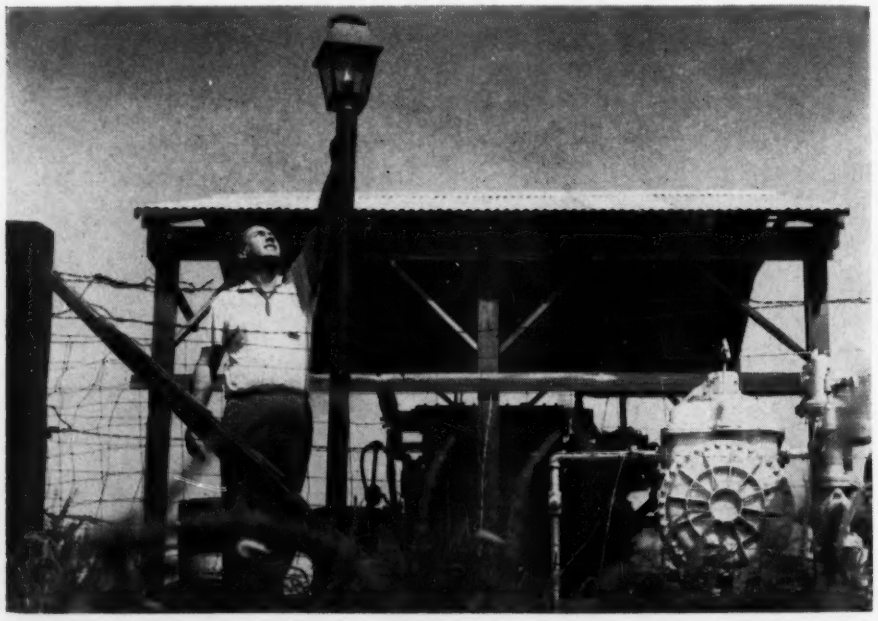
Nine new members were elected to two-year terms to the Association's board: H. Reid Derrick, president, Laclede Gas Co.; W. M. Elmer, president, Texas Gas Transmission Corp.; Roy E. Jones, president and general manager, North Shore Gas Co.; and Otto W. Manz, Jr., executive vice president, Consolidated Edison Co. of New York, Inc.

Also Dale B. Otto, president, New Jersey Natural Gas Co. Arthur B. Ritzenthaler, vice president for sales, The Tappan Co.; Charles M. Sturkey, president, Washington Natural Gas Co.; and Guy W. Wadsworth, Jr., president and general manager, Southern Counties Gas Co.

Six gas leaders were re-elected to the board. They include Eskil I. Bjork, chairman of the board, The Peoples Gas Light & Coke Co.; H. Donald Borger, president, The People's Natural Gas Co.; William G. Hamilton, Jr., president, American Meter Co.; William J. Harvey, vice president in charge of gas operations, Public Service Electric & Gas Co.; Andrew W. Johnston, vice president in charge of gas operations, Boston Gas Co.; and E. Clyde McGraw, president, Transcontinental Gas Pipe Line Corp.

Gerald T. Mullin, president of Minneapolis Gas Co., was elected to serve a year on the board to complete the unexpired term of Heyke, who was named to the board in 1959.

Wister H. Ligon, president of Nashville Gas Co., and retiring president of A.G.A., also became a member of the board for a one-year term beginning today.



Why not use natural gas to light natural gas irrigation pumping engines? "It's a natural," says Jerry Broking, Arizona Public Service Co. commercial and industrial salesman at Douglas. "For a minor cost, it gives dependable light for handy night checking and maintenance chores, plus protective lighting against pilferage." Owner of the gas light, first used by an engine on Arizona system is Velma Ann Lockwood, whose farm is just north of Bowie.

Peoples Gas Light and Coke Company's subsidiaries merge. Natural Gas Pipeline Company of America took over assets and operations of Peoples Gulf Coast Natural Gas Pipeline Company early in October. Both companies own long-distance transmission lines and are subsidiaries of Peoples Gas. Combination of these companies will make possible more flexible operation and certain economies in administration, Eskil I. Bjork, chairman of Peoples Gas noted. Natural Gas Pipeline's transmission lines extend from northern part of Texas to Joliet, Illinois; facilities of Peoples Gulf Coast extend from the Texas Gulf Coast area to Joliet.

Why drill services?
PUNCH 'em!

Four small guides which hold punch to its true axis.

For taking services off mains. A quick, safe, steel (shell casting) welding tee that incorporates in each tee a punch and positive shut-off. Does away entirely with drill devices. We also have a model threaded at the base to screw into the saddle.

Punches. ¼", 5/16" and ⅜" diameter, recommended for 5/16" (or thinner) pipe wall thickness. ½" diameter, restricted to use on ¼" wall thickness or thinner.

Each tee is tested to 5,000 p.s.i. hydraulic pressure, and carries "Rated 1,000 pounds". A 5 to 1 safety factor. Made from steel similar to pipe, it welds easily, and in the saddle model, takes a perfect thread.

Both sizes made have 1" base. Side outlet can be furnished ¾" or 1", end beveled for welding, standard pipe size, either threaded, or smooth for compression coupling. Or outlet can be internally threaded for ½" pipe size.

With this tee you will be forever free from the cost of drilling machines, broken drills and drill machine maintenance and repairs. We feel this tee is the finest service improvement ever offered to the gas industry. Write for circular with installation instructions.

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA

SKINNER-SEAL PUNCH-IT TEE

Newsreel

Reorganization of the Florida-Georgia Gas Association into The Florida Natural Gas Association has been completed and the new group has adopted a comprehensive industry promotional program. Composed exclusively of privately-owned and municipal natural gas distribution systems

J. T. Bills

D. B. Sprow

in Florida, the new association is headed by John T. Bills, vice president of Peoples Gas System of Florida. Other officers are Dwight W. Sprow, executive vice president of The Houston Corporation, as vice president; and Harry H. Phipps, manager, commercial and industrial air conditioning sales, The Houston Corporation, as secretary-treasurer. Reorganized to bring into the association in active capacities top executives of the natural gas utilities in Florida, the association's new charter establishes three classes of members — corporate, associate, and affiliate. A technical conference and equipment conference were created and charged with conducting training programs for operations, distribution, sales and accounting during each year, and providing technical assistance on appliances and equipment of the natural gas industry.

The Columbia Gas System, Inc. has been selected for first place award for the best security analyst yearbook of the natural gas industry in the Twentieth Annual Report Survey sponsored by "Financial World." Award was accepted on behalf of the system by Alan A. Cullman, vice president of Columbia Gas System Service Corporation, under whose supervision the book is prepared each year.

Interior Department reports marketed production of natural gas in the U. S. totaled 12,046 billion cu ft in 1959, a 9% increase over 1958. Imports totaled 134 billion cu ft – about the same as in 1958. Average wellhead value was up one cent to 12.9 cents a thousand. Average value at point of consumptions was up a cent and a half to 47.7 cents.

Revised Federal Power Commission's map of "Major Natural Gas Pipelines" in the United States is now available. New map supersedes the December 31, 1959, edition and is for sale only by the FPC.

Rochester Gas and Electric Corporation has been selected for first place award for having issued the best stockholder annual report of the Public Utility industry in the Twentieth Annual Report Survey sponsored by "Financial World," national weekly magazine. Symbolic of the achievement, a bronze "Oscar-of-Industry" trophy was presented to Ernest J. Howe, president of the company, October 24 at an awards banquet in New York City. Close to 5000 reports were reviewed in 96 categories during the 1960 competition. In the Public Utility industry classification, New York State Electric and Gas Company was runner-up for the top award.

Purchases of natural gas by interstate transmission companies in 1959 as reported to the Federal Power Commission totaled 7,766,091,446 Mcf for which the pipeline companies paid $1,097,193,512.75, or an average price of 14.13 cents per Mcf. These purchases, made at the wellhead, in the field and from gasoline plants have been compiled in a 300-page report of gas sales and purchases by H. Zinder & Associates, gas and oil consultants.

The report, entitled "1959 Natural Gas Purchases by Interstate Natural Gas Companies," shows the largest pipeline purchaser of gas last year was United Gas Pipe Line Co.; El Paso Natural Gas Co., was second, and Tennessee Gas Transmission Co. third on basis of gas volume. Nation's leading seller of natural gas to interstate pipelines in 1959 was Phillips Petroleum Co. with total sales topping 642,000,000 Mcf for a total revenue of $80,152,375.70 or an average of 12.48 cents per Mcf. Pan American Petroleum Co. was second to Phillips with sales amounting to 421,027,855 Mcf for $57,259,901 or an average of 13.60 cents per Mcf.

Copies of the comprehensive report which lists summaries of purchases by states and countries, by purchasers and sellers, listed alphabetically and by volume, are available through H. Zinder & Associates' Washington, D. C. office for $25 each.

Thermoelectric cathodic protection ... became a reality recently as Northern Illinois Gas Company personnel installed a 10-watt thermoelectric generator, powered by natural gas, at its LaGrange station. Photo shows unit being placed in special housing; current is provided to old mains in station area that are used as a ground bed. NI-Gas installation is believed to be first commercial application of the thermoelectric generator in this country. Company also has received a 20-watt unit and has on order a 100-watt unit for further studies. *(See AGJ, March 1960, page 20.)*

Statement Required by the Act of August 24, 1912, as Amended by the Acts of March 3, 1933, July 2, 1946 and June 11, 1960 (74 Stat. 208) Showing the Ownership, Management, and Circulation of

AMERICAN GAS JOURNAL

Published monthly except semi-monthly in August, at Dallas, Texas for October 1, 1960.

1. The names and addresses of publisher, editor, managing editor, and business managers are:

Publisher: The Petroleum Engineer Publishing Co., 800 Davis Bldg., Dallas, Texas.

Editor: Dean Hale, 800 Davis Bldg., Dallas, Texas.

Business Manager: Joe B. Woods, 800 Davis Bldg., Dallas, Texas.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

The Petroleum Engineer Publishing Company, 800 Davis Bldg., Dallas, Texas.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 6,843.

Dean Hale, Editor.

Sworn to and subscribed before me this 23rd day of September, 1960.

(SEAL) Grace H. Harkins
Notary Public, Dallas County.
(My commission expires June 1, 1961)

UNEQUALLED IN ITS CLASS

RELIANCE SERIES 1200

DOMESTIC SERVICE REGULATOR

Developed specifically for house service installations, the economical Series 1200 four-inch diaphragm class regulators provide many *exclusive* quality features with field-proven, dependable performance. Series 1200 Reliance regulators provide the most advanced design for those companies whose systems lend themselves to use of small regulators for compact meter settings.

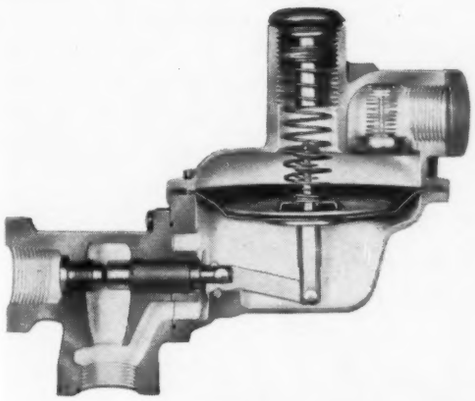
Capacity of the 1200 Series is 270 cfh at 2 psi inlet, $\frac{5}{16}$-inch orifice and 1-inch w.c. pressure drop, with correspondingly higher capacities for other inlet pressures and orifices. Suitable for inlet pressures to 125 psi and outlet pressures from 5- to 15-inches w.c. Manufactured to conform to A.S.A. Code requirements.

Two models are available . . . standard Model 1203 and *full capacity internal relief* Model 1213B. Both models are also provided as Series 1300 regulators with *detachable* meter bar for 6- or 11¼-inch connection centers.

See Bulletin 105 for complete details and specifications.

CHECK THESE EXCLUSIVE FEATURES!

- RUGGED CAST IRON PIPE SECTION provides maximum strength — prevents thread galling.
- POSITIVE LOCKUP — gives over 20% greater available lockup power than any comparable regulator of its class — provides greater safety factor in event of foreign matter on valve seat.
- REMOVABLE DIAPHRAGM SECTION for ease of servicing without disturbing piping connections — valve seat disc easily replaced.
- TWO-PIECE CONSTRUCTION permits choice of four valve head positions.
- ADJUSTABLE RELIEF VALVE for accurate setting of any desired relief pressure.
- DETACHABLE METER BAR models available for both 6- and 11¼-inch connection centers.



CHECK THESE QUALITY FEATURES!

- Compact design reduces meter set assembly costs — elbow-type cast iron head simplifies piping connections.
- Relief valve stop assures relief valve operation under the most severe conditions.
- Extra-large ¾-inch weatherproof screened vent provided in four basic positions.
- Die-cast aluminum alloy body and top for ease in handling, shipping and setting.
- Brass orifice easily changed through inlet connection.
- 125 psi maximum inlet pressure. Springs available for outlet pressures from 5- to 15-inches w.c. Body sizes ¾- and 1-inch. Orifice sizes ⅛-, ³⁄₁₆-, ¼-, and ⁵⁄₁₆-inches.

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INCORPORATED (ESTABLISHED 1836)

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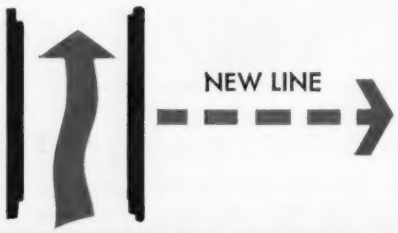
Sales Offices in Principal Cities

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

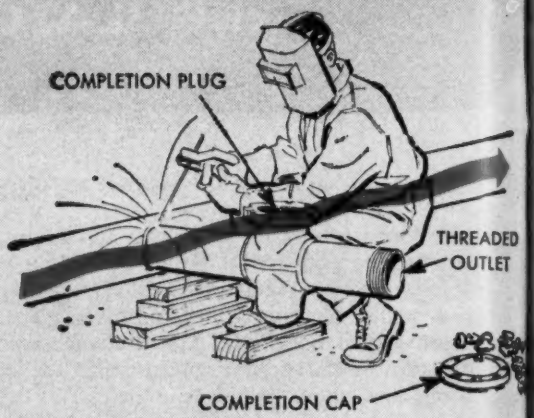
hot taps without v

PROBLEM:

Tie in a new, permanent 6" line to present operating system without interrupting flow. Provide means of valving in new line without installing permanent valves.

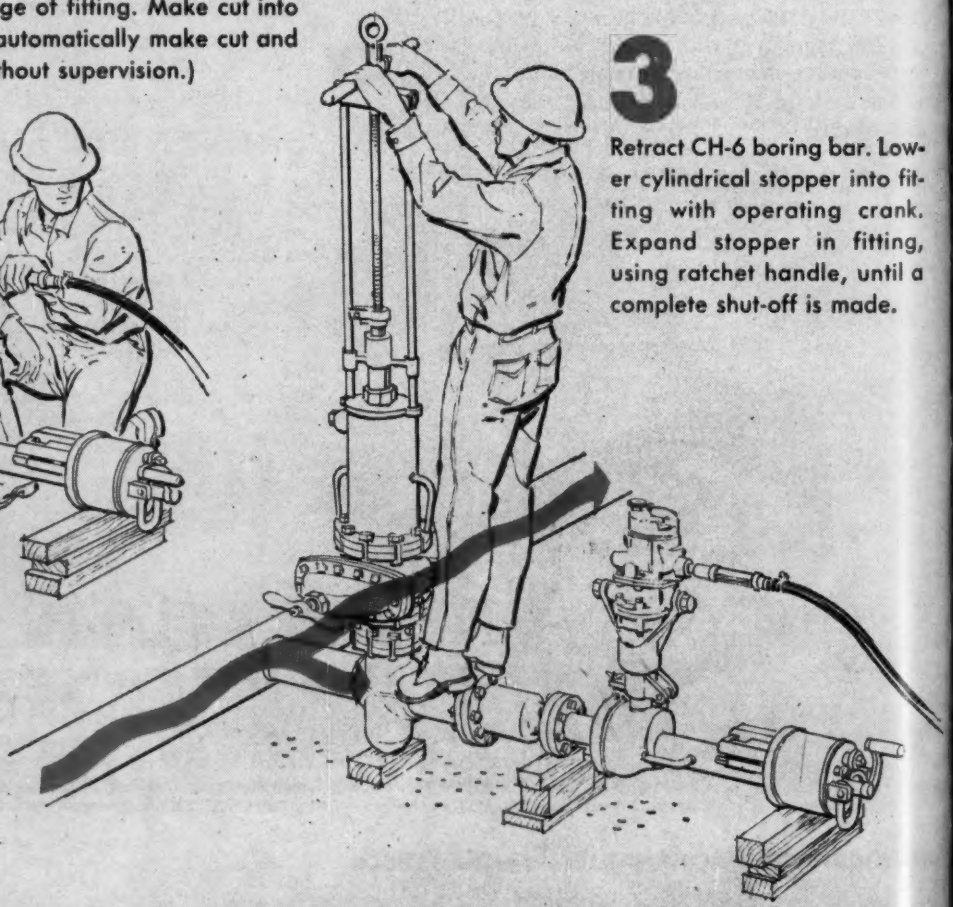


HERE'S HOW



1 Weld exclusive Mueller Extension Stopper Fitting to operating line. (6" fitting shown. Other sizes from ¾" to 8" available.)

2 Attach Mueller CH-6 Drilling Machine to outlet of fitting by using companion flange. Bolt Mueller H-17340 Stopping Machine and Gate Valve to flange of fitting. Make cut into line. ("CH-6" will automatically make cut and disengage feed without supervision.)



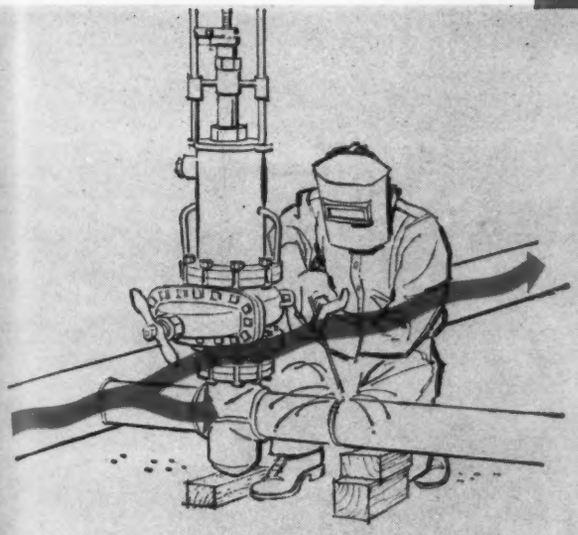
3 Retract CH-6 boring bar. Lower cylindrical stopper into fitting with operating crank. Expand stopper in fitting, using ratchet handle, until a complete shut-off is made.

tvalves!

ANOTHER IN A SERIES

on applications of

MUELLER® NO-BLO® METHOD

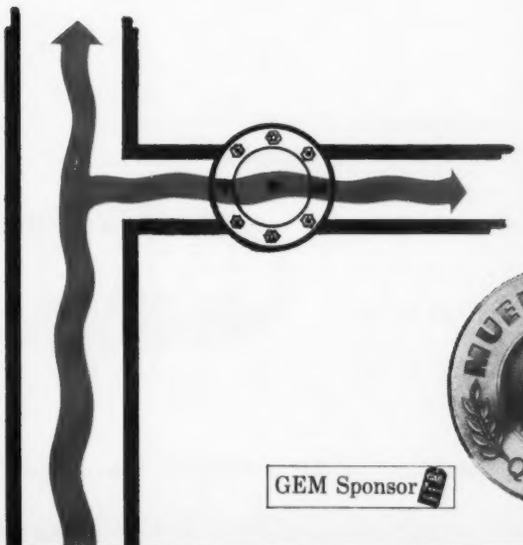


4 Remove CH-6 Machine. Attach new line to fitting and extend to next valve. (Companion flange may be used to connect line or threads may be cut off for welding connection.)

5 Equalize pressure in new line. Contract and raise stopper. Close valve and remove stopping machine. (New piping is now under full pressure.) Bolt Mueller H-17346 Completion Machine to gate valve, open valve and screw completion plug into top of fitting. Remove machine and gate valve and bolt completion cap to flange of fitting.

SOLUTION:

Line has been safely tied in under full system pressure without shutdown or other disturbance to operating facility. Only maintenance-free fitting remains in new line—no valve! Stopping machine may be re-mounted on fitting and line stopped-off whenever needed.



These fittings and machines are just a small part of Mueller's complete system of No-Blo products—products especially designed for use with fluid facilities under pressure.

No-Blo products and methods make it possible to extend dead ends, to transfer service to another line, to isolate a section of line, to repair leaks, to make tie-ins, to run laterals, to install or replace equipment—all under full operating pressure in a safe, controllable manner and without shutdown!

The No-Blo System is typical of the constant attention to detail—and more than a century of experience—in research, design and engineering that is a part of all Mueller fittings and equipment.

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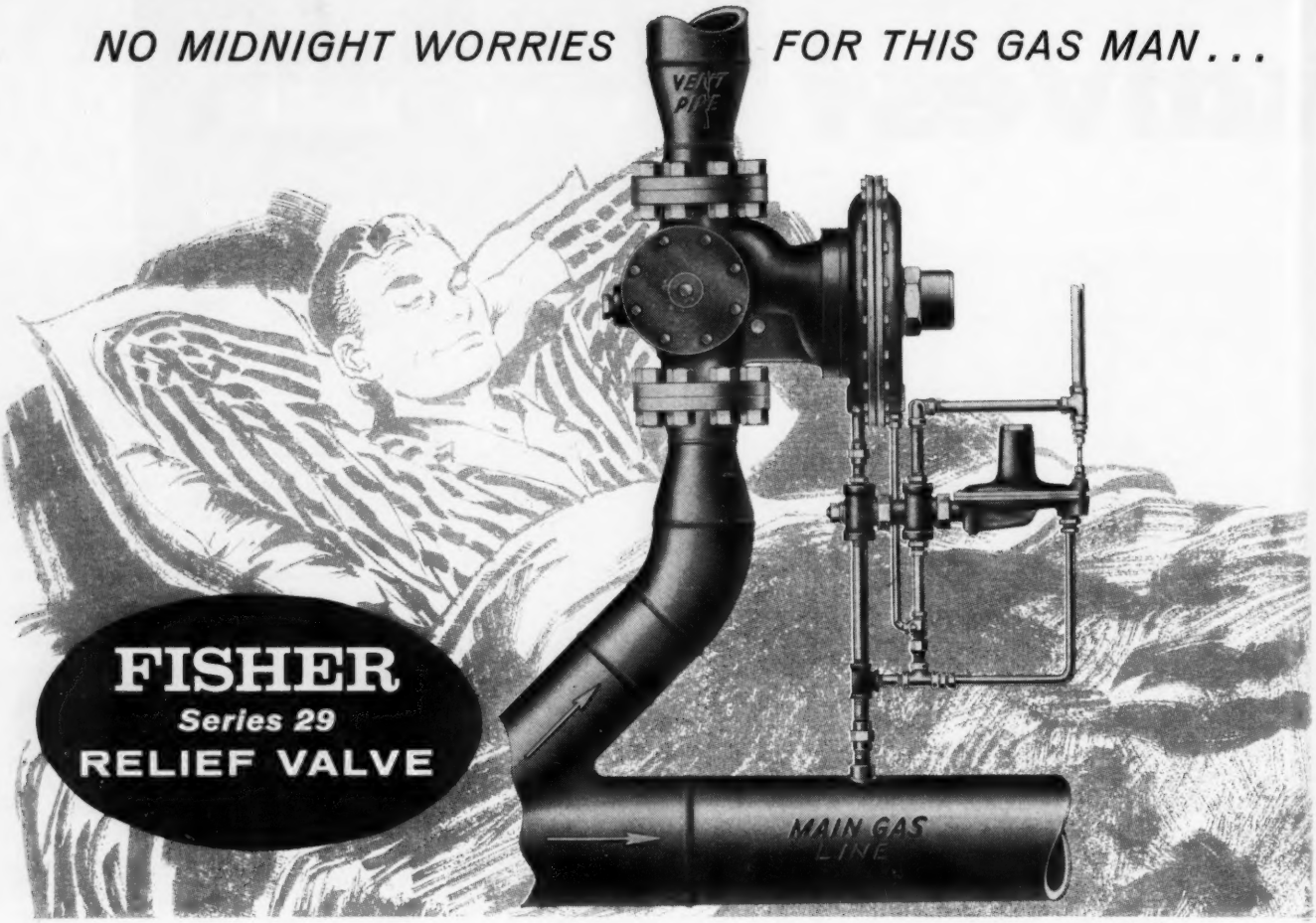

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Series 29
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and intermediate

Prevents hazardous conditions in low pressure systems

Don't gamble with the safety of your system! Put a Fisher Series 29 Relief Valve on the downstream line to make *sure* that excess pressure is released in case of emergency. Free-Flo design of the Series 29 will relieve at maximum gas flow without building up pressure in the downstream system.

Throttling action permits the Series 29 to relieve *only* the excess gas required, then shuts off tight, automatically, without leaking. System will not fall below normal pressure. Valve opens and closes on a range of approximately 4" W.C.

One rapid adjustment changes relief setting. Valve can be tested without over-pressuring system. Available in 4", 6", or 8", 125 lb. ASA flange bodies.

For low pressure distribution systems, the Type 29 has proven itself in thousands of installations. For higher pressures, Fisher now has available the Type 29H, designed for intermediate gas distribution systems. The Type 29H handles relief settings up to 50 psi.

PRESSURE RANGES

Series 29 is available with exact relieving pressure within the following ranges. May be adjusted in the field.

TYPE	SPRING DWG. NO.	ADJUSTABLE RANGE	PRESSURE CHANGE TO STROKE MAIN VALVE WIDE OPEN
29	1B5370	11" w.c. to 28" w.c.	4" w.c.
	1B5371	1 to 2½ psi	0.2 psi
	1B5372	2¼ to 4½ psi	0.3 psi
	1B5373	4½ to 7 psi	0.5 psi
29H	1D8923	5 to 15 psi	0.5 psi
	1D6659	15 to 35 psi	1.4 psi
	1D7455	20 to 50 psi	2.0 psi

PRESSURE LIMITATIONS

VALVE BODY SIZE	TYPE 29 MIN. RELIEF SETTING	TYPE 29 MAX. RELIEF SETTING	TYPE 29H MIN. RELIEF SETTING	TYPE 29H MAX. RELIEF SETTING
3"	....	....	5 psi	50 psi
4"	11" w.c.	18 psi	5 psi	40 psi
6"	11" w.c.	10 psi	AVAILABLE ON	
8"	11" w.c.	5 psi	REQUEST	

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COMING EVENTS IN THE GAS DISTRIBUTION INDUSTRY

November

1 NEGA operating division, Statler Hilton Hotel, Hartford, Connecticut.

3 Metal Treating Symposium, New Englander Motor Hotel, Westport, Connecticut. Sponsored by A.G.A. and The Bridgeport Gas Company.

14-16 American Petroleum Institute, annual meeting, Chicago, Illinois.

15 Joint American Gas Association personnel seminar, sponsored by A.G.A., New Jersey Gas Association, and Pennsylvania Gas Association, Bellevue Stratford Hotel, Philadelphia, Pennsylvania.

15-16 Natural Gas Pipeline Institute, Court Room Court House, Liberal, Kansas.

18-22 Air Conditioning and Refrigeration Institute annual meeting, Hollywood Beach, Florida.

27-Dec. 2. ASME winter annual meeting, Statler Hilton Hotel, New York City.

28-30 A.G.A.-EEI Electronics Seminar, The Claridge Hotel, Atlantic City, New Jersey.

December

5 - 9 A.G.A. Gas Air Conditioning Sales School, Nationwide Inn, Columbus, Ohio.

January, 1961

17 NEGA operating division, Statler Hilton Hotel, Boston, Massachusetts.

February

3 NEGA-C-H-I division, Sheraton Biltmore Hotel, Providence, Rhode Island.

15 NEGA street department supervisors group, Hotel Bancroft, Worcester, Massachusetts.

23-24 A.G.A.-PCGA joint public relations conference, Benson Hotel, Portland, Oregon.

March

2- 3 SGA transmission management, Sheraton-Dallas, Dallas, Texas.

13-17 National Association of Corrosion Engineers, annual conference, Hotel Statler, Buffalo, New York.

16-17 SGA distribution management, Dinkler Plaza Hotel, Atlanta, Georgia.

16-17 NEGA annual meeting, Statler Hilton Hotel, Boston, Massachusetts.

16-17 Oklahoma Utilities Association, annual meeting, Tulsa Hotel, Tulsa, Oklahoma.

27-28 Mid-West Gas Association annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha, Nebraska.

April

4- 6 A.G.A. research and utilization conference, Cleveland, Ohio.

6- 7 PCGA distribution conference, Biltmore Hotel, Los Angeles, California.

10-21 American Welding Society, International Institute of Welding, annual convention and welding exposition, Sheraton-Atlantic, New York, New York.

11-13 A.G.A. sales conference on industrial and commercial gas, Prince Edward, Windsor, Ontario, Canada.

13-15 GAMA annual meeting, Boca Raton, Florida.

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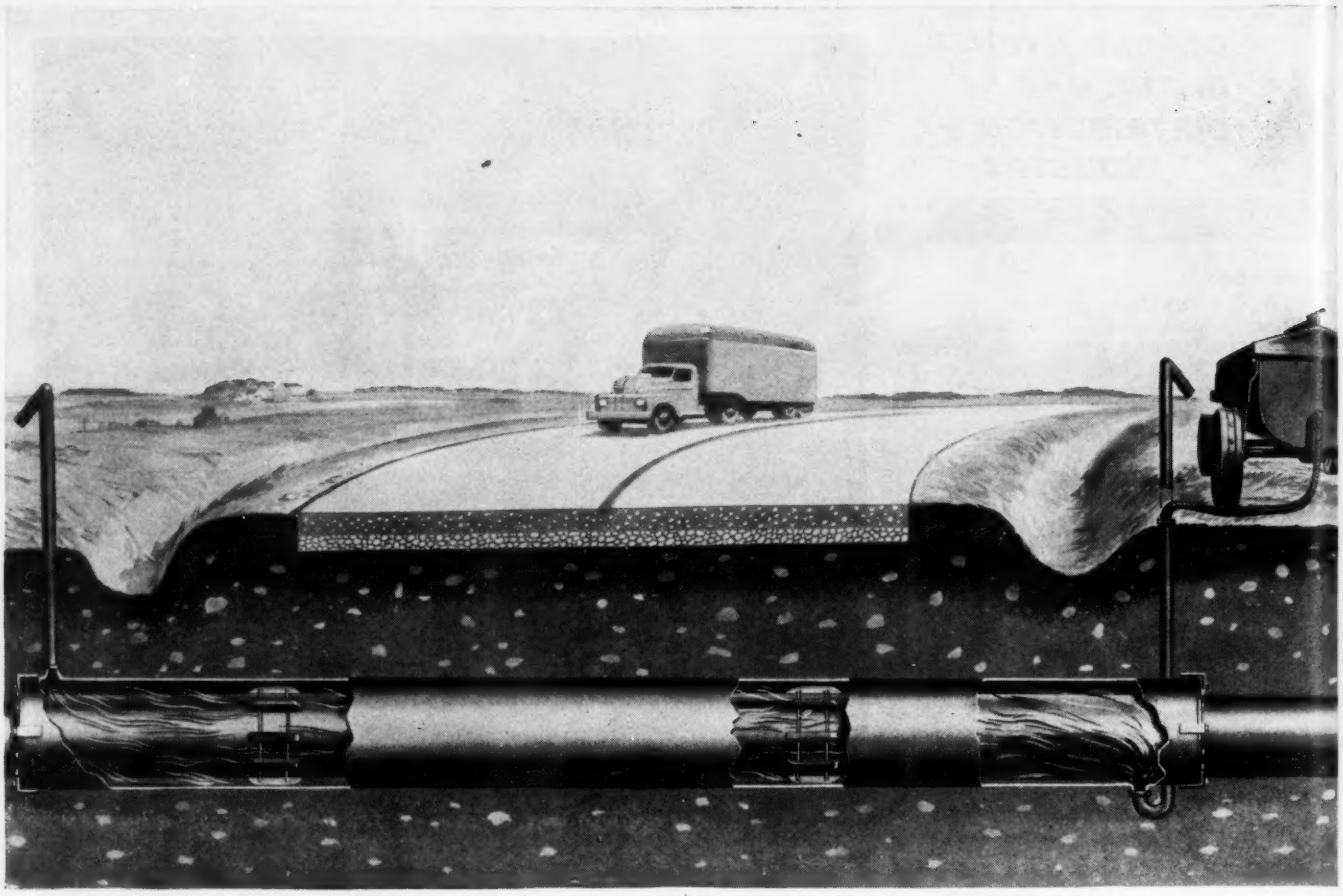

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NO-OX-ID® CM casing filler gives complete and dependable control of destructive frost-heave in gas lines under highway and railroad crossings.

This addition to Dearborn's time-proved line of chemically inhibited protective coatings virtually eliminates frosting conditions caused by low gas temperatures on the discharge side of regulator stations. This pressure-variance induced temperature drop occurs regardless of outside weather conditions and the consequent pipe heave from underside frost and icing can result in substantial pavement cracking and damage.

CM casing filler is introduced by pumping into the under-highway pipe casing required by most State Highway Commissions. It completely fills the annular space, displacing entrapped air and preventing water accumulation. CM filler solidifies to a soft jell without appreciable change in volume and retains this consistency through wide temperature ranges.

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MEN AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

● **Lewis R. Gaty** has been elected vice president in charge of engineering and research for Philadelphia Electric Co. He has been serving as vice president of research and development since 1956 and now assumes additional responsibility of the engineering organization of the utility.

L. R. Gaty

J. R. Delaney

S. T. Olinger

R. W. Alexander

● Cincinnati Gas & Electric Co. has announced the promotion of **J. Robert Delaney,** manager of gas sales division, to manager of the gas department, a new position in the gas department. He will be responsible for operations, engineering, and sales. **Stanton T. Olinger,** assistant to Delaney, will be in direct charge of the gas sales department, and **Robert W. Alexander,** supervisor, gas engineering division, becomes assistant manager of gas operations.

● **T. H. Evans** has been elected president of Carnegie Natural Gas Co. and Apollo Gas Co., subsidiaries of United States Steel, succeeding **Harlan H. Pigott** who is retiring. Evans was formerly vice president of the two utilities.

● **Alabama Gas Corp.** has announced the following promotions: **James A. Martin,** distribution superintendent at Selma, to assistant chief engineer; **James J. Cassidy,** service foreman at Anniston, to new distribution superintendent at Selma; **George O. Sims, Jr.,** staff engineer, general engineering, Birmingham, to district service foreman at Montgomery; **Walter S. Wilson,** assistant general superintendent at Birmingham, to assistant manager Tuscaloosa district; **James C. Taylor,** project engineer, to assistant industrial engineer, and **Roy F. Etheridge,** engineer in the Gadsden, Opelika, and Montgomery districts moves to staff engineer in the general office where he will assist utilization engineer **John S. Carothers.**

● **Tom Keefe** has been appointed supervisor of employee publications for Arizona Public Service Co. His duties will include editing *Spark & Flame,* as well as supervising other employee publications.

● **Allan P. Good,** has been elected assistant controller of Northern Indiana Public Service Co. succeeding Irving E. Fason who died in September.

● **J. Fred Gresham,** former sales supervisor of Little Rock gas distribution department, has been appointed distribution engineer in the Arkansas division of Arkansas Louisiana Gas Co. **Ernest E. Bagley,** distribution engineer at Shreveport, has been named sales representative for Reynolds Gas Regulator Co., Inc. an ALG subsidiary at Anderson, Indiana.

● **Harvey H. Plank,** chairman of the board of directors of Delaware Power & Light Co. has announced his retirement effective October 1. **Frank P. Hyer,** president and general manager, has been elected chairman of the board and chief executive officer succeeding Plank. **Austin T. Gardner,** vice president and secretary will succeed Hyer as president.

● **C. H. Smith,** McPherson, superintendent of gas production and plants for The Kansas Power and Light Co. retires November 1 after 31 years of service with the utility. **James C. Rauch** of Salina, will succeed him as superintendent of plants in the company's gas division.

● Michigan Consolidated Gas Co. has appointed **Harold R. Lauer** as supervisor of the builder management division to work with home builders and apartment management companies. **Raymond W. Lindberg** has been appointed superintendent of display for the utility with responsibility for floor and window displays in Detroit and 10 districts across the state.

● **Joe W. Zodrow, Jr.,** has been promoted to general sales consultant in the general sales department of Oklahoma Natural Gas Co. Formerly a representative in the Tulsa district sales department, Zodrow will coordinate commercial gas sales activities throughout ONG's service area in his new position.

● New York State Natural Gas Corporation has announced the appointment of **Emery D. Hoenshell** as system manager of community services for Consolidated Natural Gas Co. in connection with the parent firm's industrial market development program. Hoenshell will headquarter in Pittsburgh where he will provide technical advice and assistance to area development managers of Consolidated companies.

● Cambridge Gas Co. has announced a change in title for **Richard C. Gaulin** from engineer-distribution to staff engineer. In addition to his duties in gas flow, he will be responsible for production improvement and education.

● **Bruce Fearn** has been appointed supervisor of Philadelphia Electric Co.'s residential and commercial sales department in Philadelphia, succeeding **Paul J. Blanc,** retired. Other recent personnel changes include appointment of **Roland V. Bowest** as manager of Coatesville commercial office; **Francis X. Boyle** as general supervisor of credits and collections in Philadelphia; and **Francis A. McGrath** as collection supervisor for the utility in North Philadelphia.

● Saskatchewan Power Co. has appointed **Charles Chevalier** chief draftsman and engineering records officer in charge of company's new drafting department.

1897

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Improved Locking Sleeve

PIPE STOPPERS OF ALL KINDS

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Vegetation Method, Safety, and Combination Surveys increase the safety factor of distribution systems.

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Fully equipped, thoroughly trained SCF crews are on call to repair the leaks found — saving gas, without costly build-up of equipment and personnel by the operating company.

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[illegible] L. Garrison has joined Kraloy [illegible] Pipe Co. as national manager of gas industry sales succeeding **Russell W. McIntosh,** who is joining a manufacturer of basic plastic. Garrison will headquarter in Kraloy's new Santa Ana, California, plant.

D. L. Garrison

J. F. Donnelly, Jr.

● **James F. Donnelly, Jr.** has been appointed manager of advertising and sales promotion for Permaglas division of A. O. Smith Corp. He was formerly supervisor of sales promotion with Permaglas.

● **Hal P. Stephenson** has joined the sales staff of Vulcan Rubber Products Division of Reeves Brothers, Inc. His territory will include Delaware, Maryland, Pennsylvania, Washington, D. C., West Virginia, and parts of New York state.

● **Donald P. Faulhaber** of Robertshaw-Fulton's International Division at firm's headquarters in Richmond, has been appointed eastern sales representative for the company's Grayson Controls Division. In his new capacity, Faulhaber will headquarter at Haddonfield, New Jersey.

● **Dr. Philip Anderson** of Evansville, Indiana, has been elected vice president in charge of research and development for Arkla Air Conditioning Corporation at its Evansville Plant succeeding **R. K. Eskew,** who has resigned to accept employment elsewhere in the industry. Dr. Anderson has been serving as chief engineer for Arkla in its research and development program since rejoining the firm a year ago.

● **William F. Gulley** has been named regional manager in the western region for Rockwell Manufacturing Company's Meter and Valve Division. Previously he has been San Francisco district manager for the Meter & Valve Division, and will be succeeded by **Nelson E. Davenport** in that position.

● **Albert L. Sylvester** of Cohasset, Massachusetts, **Raymond H. Faxon** of Milton, Massachusetts, and **James L. Harper** of Jesup, Georgia, have been elected to the board of directors of ICED, Incorporated, St. Petersburg manufacturer of gas-operated air conditioners. Three new directors all are directors of Southern Gas & Water Co., Charleston, W. Va., which has acquired an option to buy control of ICED.

● **Thomas H. Wilder III** has been appointed manager of the recently-opened San Francisco branch sales office of Datamatic Division of Minneapolis-Honeywell.

● Philco Corporation has announced opening of its Dallas Computer Division office in the Exchange Bank Building headed by **Charles R. Burke** who will be district sales manager.

● Royston Laboratories, Inc., manufacturer of protective industrial coatings, has appointed **Thomas G. Giles** Chicago district manager to succeed the late Harry N. Strothman. Illinois, Indiana, Iowa, Wisconsin and Minnesota will be served from the Chicago office.

● **Charles A. Ashby, Jr.** and **George C. King** have been elected vice presidents of Stone & Webster Service Corporation, management consulting subsidiary of Stone & Webster, Inc.

● **Charles F. Stubbs** of Montgomery has been elected president and chief executive officer of Mobile Gas Service Corp. of Mobile, Alabama, succeeding **Kenneth R. Teele,** who resigned to devote his time to other interests. Previously Stubbs has been chief engineer of Alabama Gas Corp.

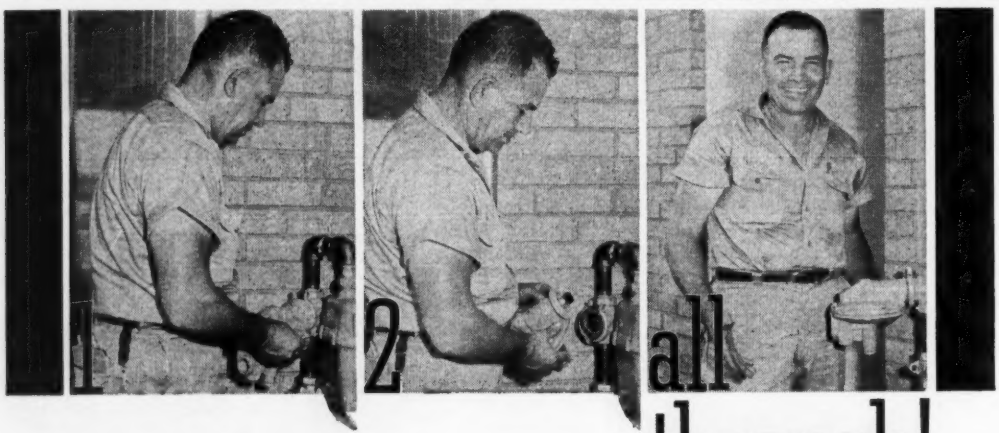
Deaths

Earle N. Scott, 58, purchasing manager of Long Island Lighting Co., died October 6 in Ghent, N. Y. after 4-week illness.

Donald F. Kurtz, 61, manager of Philadelphia Electric Co.'s rate and standard practice division, was among those killed in the Boston harbor plane crash October 4.

Fred C. Kellogg, president of Pioneer Service & Engineering Co., died September 27 at his home in Madison, Wisconsin, after a short illness.

S. R. Walker, 66, pioneer of gas development in the Arkansas River Valley, retired president of Fort Smith Gas Corp. and Stephens Production Co., and a director of Arkla Air Conditioning Corp., died August 9.



4 models: Standard no-seal; automatic cutoff; full capacity internal relief; internal relief and automatic cutoff combined.

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Inspection's a breeze with this versatile, popular Reynolds house service regulator. Exclusive V-band stainless steel coupling with a single screw allows simple 1-2-3 inspection as shown above: 1. Diaphragm case comes off easily. Valve body stays in line. 2. Valve disc and seat inspected. 3. All through! After screw quickly inserted in V-band clamp.

Now's the time to stock up on this fine house service gas regulator. For a look at our entire line, write for a free catalog.

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GAS CONTROL Since 1882

ARKLA

REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA

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No "Kid Glove" treatment here!

...AMERICAN DUCTILE IRON® pipe withstands toughest service conditions!

Faced with high internal gas pressures? Heavy crushing loads? Extreme shock and stress? When you expect severe service conditions and want a "permanent" pipe line . . . specify super-strength AMERICAN DUCTILE IRON pipe.

AMERICAN DUCTILE IRON pipe combines the most desirable properties of both gray cast iron and steel; you get the proven long life of cast iron plus the ductility, toughness and higher strength of steel. In fact, this pipe may actually *bend* under stress . . . without breaking! These advantages are particularly needed for service under deep fills, under busy highways, and for other installations where shifting soils or earth settlement may impose severe loading on the pipe line.

AMERICAN DUCTILE IRON pipe provides *extra* safety factors for all standard distribution pressures . . . is easy to tap for services without saddles or welding . . . needs no special wrapping or protective coating to provide long life. Your nearby American Cast Iron Pipe Company representative will gladly show why AMERICAN DUCTILE IRON pipe should be the choice for *your* gas distribution system. Call or write for free illustrated catalog.

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Abstract

A number of techniques have been investigated for the storage of large volumes of natural gas in belowground structures. Storage of natural gas in its liquefied state appears to have many advantages over either absorption in LPG, adsorption on activated charcoal or Fullers earth, or chemical combination as solid hydrate.

Comparisons of cost estimates indicate that a mined cavern designed to store 1 billion std cu ft of natural gas as liquid would cost only ½ to ¾ as much as standard aboveground storage tanks for the same total volume. Construction cost estimates for a steel-roofed belowground storage pit were only ⅕ to ¼ as high as for standard tanks. Calculated evaporation rates from the belowground storage systems are equivalent to, or less than, those reported for aboveground tanks.

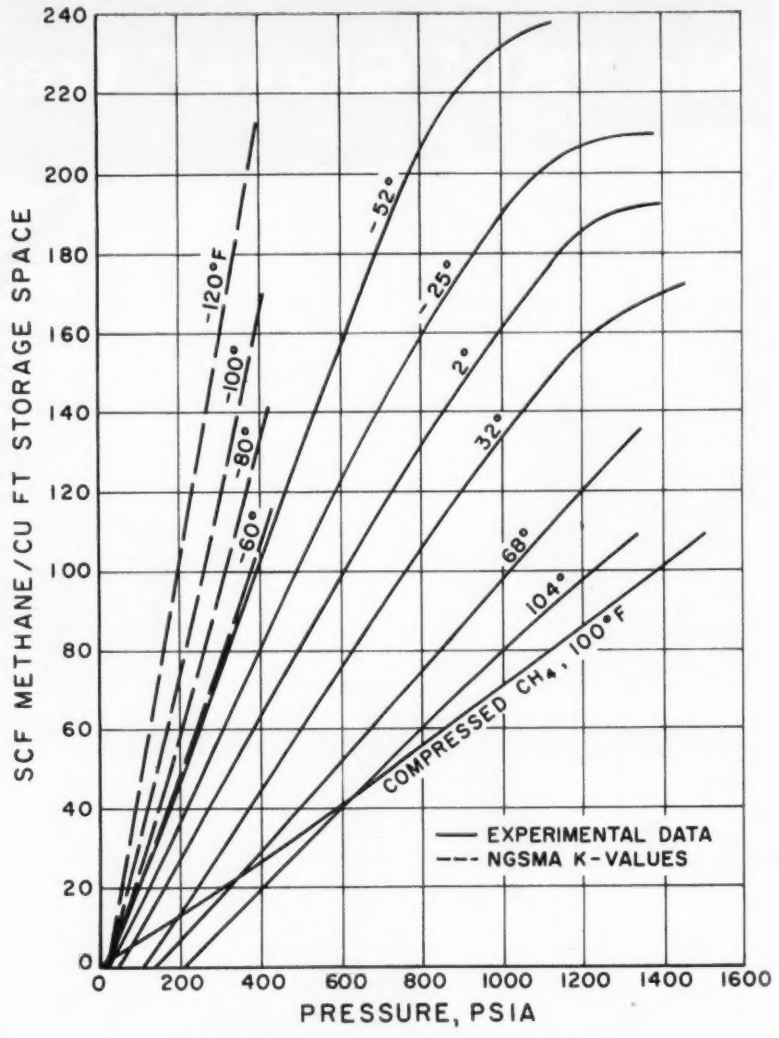

Fig. 1. Effect of pressure on quantity of methane absorbed in liquid propane at various temperatures.

Non-Conventional Storage of Natural Gas

Of all methods examined — including absorption in LPG, adsorption on activated charcoal or Fullers earth, or chemical combination as solid hydrate — storage of natural gas in liquefied state appears to have the most advantages

B. E. Eakin,
Institute of Gas Technology, Chicago, Illinois

Continued expansion and growth of the natural gas industry has created an ever more pressing problem—the need to store large quantities of gas close to the metropolitan areas in order to meet winter peak demands.

Where depleted petroleum or natural gas reservoirs of adequate volume and permeability are available, creation of underground storage fields has proved to be both a satisfactory and economic solution.

There are many areas, however, where such formations are not available, or have already been completely developed. In order to plan for the additional capacity required for the future, it is necessary to examine the alternative storage techniques that are available.

For many years, natural gas and petroleum companies have been storing LPG, and other petroleum products, in mined caverns in impermeable limestone or shale formations, and in solution cavities in rock-salt formations. It was felt that development of cavern storage systems for natural gas would probably be the most economic means of providing this new capacity.

Accordingly, in 1959 the Gas Operations Research Committee of American Gas Association began sponsorship of "Nonconventional Storage of Natural Gas," Project PB-35 at the Institute of Gas Technology, with the objective of studying the feasibility of various proposed techniques for below-ground, large volume storage of natural gas near the point of consumption. This article presents a summary of the results of the initial phase of this study.

Available Storage Techniques

The techniques examined include storage in the gas phase at high pressure, and by absorption in liquids, adsorption on solids, reversible chemical combination, and liquefaction. The various systems are presented on the basis of relative volume requirements for storage.

Absorption. Natural gas is slightly soluble in many materials, and very soluble in other hydrocarbons. Possibly the best known sorbent is propane, for which the solubility of natural gas (assumed to be pure methane) is presented in Fig. 1. The maximum quantity of natural gas that can be dissolved in propane at a given temperature is that which will raise the vapor pressure of the liquid mixture to the storage pressure.

For example, the operating pressure of existing caverns is governed by their depth, with a pressure gradient between 0.44 (hydrostatic) and 1.0 psi per ft depth, or, based on the depth of present caverns, a probable maximum pressure of about 600 psia.

From Fig. 1 it can be seen that at 600 psia the volume of natural gas dissolved in propane per cu ft of liquid mixture would be: 39 std cu ft at 104 F, 52 std cu ft at 68 F, 76 std cu ft at 32 F, and 155 std cu ft at −52 F.

At 100 F and 600 psia, this compares with a storage capacity of 40 std cu ft per cu ft for gaseous methane, or about the same as in the form of a propane solution at the same conditions. Thus, refrigerated storage of dissolved natural gas would tend to greatly increase the storage capacity at a given pressure, at 32 F almost doubling the storage over that at 100 F and increasing the quantity stored by 4 times at −52 F.

Fig. 1 can also be used to demonstrate the effect of temperature on the pressure required to store a given quantity of natural gas per cu ft of storage. For example, at 1400 psia and 100 F, gaseous methane storage would contain 100 std cu ft of methane per cu ft of cavern. The same 100 std cu ft of methane per cu ft of cavern could be absorbed in propane at: 1240 psia and 104 F; 1030 psia and 68 F; 770 psia and 32 F; 400 psia and −52 F; or 200 psia and −120 F. Thus, refrigeration of the storage to only 32 F almost halves the required storage pressure for the same volume of gaseous methane at 100 F, while refrigeration to −52 F reduces the pressure by 70%.

Similar calculations were made for solution of natural gas in *n*-butane. The results indicated slightly lower solubility in butane than in propane at the same temperature and pressure. However, the limited data available at low temperatures prevented a detailed investigation of the effect of composition on solubility.

Adsorption. Natural gas tends to form an adsorbed layer or film on most solid surfaces, the quantity depending on temperature, pressure, and the activity of the solid surface. Approximately 16 std cu ft of methane can be adsorbed on 1 cu ft of activated carbon at 70 F and 40 psia, which is 6 times as much as could be stored as compressed gas at the same conditions. The ratio decreases rapidly with increasing pressure, however, limiting the usefulness of this process to low pressures only.

Another adsorption technique that has been proposed is the use of Fullers earth at −250 F and atmospheric pressure. Laboratory tests have indicated that up to 200 std cu ft of natural gas can be adsorbed per cu ft of solid. There is considerable question as to whether this is a true adsorption phenomenon, or straight liquefaction in pores of the solid material.

Reversible chemical combination. Natural gas will form reversible chemical bonds with only a relatively few other materials. The most familiar combination is with water to form hydrates, a white, solid hydrocarbon-water compound. Each of the four lightest hydrocarbons, plus carbon-dioxide, and hydrogen-sulfide, will form hydrates in the presence of water under certain conditions of pressure and temperature.

The use of water makes for a cheap combining chemical, and it is possible to store about 170 std cu ft of methane per cu ft of hydrate, at 35 F and 450 psia. A stable hydrate can be maintained at atmospheric pressure, if refrigerated to about −75 F. Various proposed processes, and the physical and thermodynamic data up to 1947, are summarized in Institute of Gas Technology Research Bulletin No. 1, *The Storage of Natural Gas as Hydrate*.

Liquefaction. When natural gas is condensed, one cu ft of the liquid, at −250 to −260 F at atmospheric pressure, will contain approximately 630 std cu ft. The exact temperature and number of std cu ft will vary, depending on the composition of the particular gas. The temperature, pressure, and volume requirements for the various storage systems are summarized in Table 1.

TABLE 1. Summary of Conditions and Volumes Required for Various Storage Systems.

System	Storage Cu Ft/Mcf	Temp, F	Press., Psia
Liquefaction	1.6	−250	14.7
Adsorption	5.0	−250	14.7
Adsorption	62.5	70	40
Hydrate	5.9	35	450
Absorption	25.7	104	600
Absorption	6.5	−52	600
Compression	25.0	100	600

Comparison of Storage Techniques

Since liquefaction represents the greatest reduction in storage volume requirements, it will be used as a basis for comparison of the other techniques. There are two principal disadvantages to liquefaction:

1) it is necessary to remove about 16,000 Btu to convert one Mcf of gas at 40 F to liquid at −260 F, and

2) it is necessary to maintain a large insulated container at a very low temperature level, −260 F.

Storage of natural gas by formation of the solid hydrate has several disadvantages. The heat of formation, which must be removed at 35 F or below, is very large for hydrates—74,000 Btu per Mcf of methane. This heat must be resupplied when releasing the methane from the hydrate, and it is difficult to obtain adequate heat transfer to the solid to give rapid release rates. It would also be necessary to handle large volumes of refrigerated slurry or solid at elevated pressures, and the storage would have to be refrigerated. The principal advantages are a cheap combining chemical (water), and refrigeration requirements at a much less

severe temperature than for liquefaction. However, obvious operating difficulties in handling the solid, and the large heat of formation, tend to make this technique impractical.

The use of solid adsorbents has two very distinct disadvantages. First, the initial cost of the sorbent is high, and the volume required is large. Second, it is quite difficult to obtain rapid release rates of the adsorbed natural gas. In addition, the Fullers earth at −250 F requires refrigerated storage, and the heat of adsorption which must be removed is about 5% greater than the heat of vaporization removed in liquefaction.

The disadvantages of liquid absorbents are similar to those for the solid adsorbents. For large volume storage of natural gas, enormous volumes of LPG would be required. In order to receive any benefit from absorption, the system should be refrigerated and operated at elevated pressure. An additional problem would be that natural gas vaporized directly from the LPG sorbent would contain large quantities of LPG vapor, with the LPG concentration increasing as more of the methane is removed. One distinct advantage is that the heat of solution of methane in liquid LPG is apparently much less than the heat of condensation.

Of all the systems considered, only liquefaction and absorption appear at all attractive. The fact that liquefaction should have less operational difficulties, and require much smaller storage volumes, favors its choice as the storage technique to examine in detail.

Surface Tanks vs. Mined Caverns

Since the primary goal of mined caverns for natural gas is to obtain a low-cost large volume storage system, the first question is how construction costs of caverns compare with those of standard surface tanks for liquefied natural gas.

To obtain the answer, comparative construction cost estimates were obtained for storage of one billion std cu ft of natural gas as liquid in:

1) aboveground steel tanks with an insulated aluminum inner liner,

2) underground mined caverns, and

3) a quarried and lined surface pit with an insulated steel roof.

One billion std cu ft of natural gas as liquid at −260 F would occupy 1,600,000 cu ft, or 285,000 bbl.

Aboveground Tanks. Cost estimates were obtained from three sources for double-wall insulated surface tanks. The A.G.A. Project PT-24 Report, (1957) *Gas Storage at the Point of Use,* estimated liquefied natural gas storage construction costs as $5,200,000, with eight or ten 30,000 to 35,000-bbl tanks required. This represents $18.25 per bbl, or $5.20 per Mcf.

A second estimate was obtained from a condensation of a detailed Constock-Pritchard study on liquefaction, *The Economics of Natural Gas Liquefaction and Storage for Peak Shaving*. The incremental liquefied natural gas storage costs given there are $650,000 per 100 MMcf (one tank). This represents $22.80 per bbl, or $6.50 per Mcf.

The third estimate was from Chicago Bridge and Iron Company, which fabricated (1959) the Lake Charles, Louisiana liquefied natural gas storage tank. Their estimate is based on construction of 5 tanks, each with a capacity of 57,300 bbl, and ranges from $9.50 per bbl in the Gulf Coast area to $10.35 per bbl in the New York area. This includes planning, fabrication, foundation, erection and insulation. If pilings are required for the tanks, this could increase the cost as much as $100,000 per tank, which would add $1.75 per bbl to the quoted prices. From this it would appear that $10 to $12 per bbl, or $2.85 to $3.42 per Mcf, would be a reasonable estimate for this type of storage.

Underground Mined Caverns. The cost of constructing a mined cavern was estimated from *Refrigerated vs. Mined LP-Gas Storage* by Paul W. Tucker and C. C. Anderson of Phillips Petroleum Company. The authors estimate the cost of selecting a site, sinking and lining the shafts for mining and ventilation, and miscellaneous expenses at $350,000 regardless of the cavern size, and give a mining cost of $3.75 per bbl. This would make the total cost for a 285,000 bbl cavern about $1,420,000, which represents $5.00 per bbl, or $1.42 per Mcf.

Fenix and Scisson, Inc., have constructed over 90% of all LPG storage caverns mined to date. They concur with the estimate above, but allow a variation of ± 50 cents per bbl for labor rates, and ± 50 cents per bbl for different formations. Accordingly, the cavern costs may vary from $4.00 to $6.00 per bbl.

Heat influx calculations indicate that an insulating lining would probably be required. Gunite contractors estimated (1959) that material and application costs for applying a 6-in. coat of low-density perlite concrete to the floor, walls, and columns of a mined cavern would be $278,000, if no reinforcing were required, or $328,000 with a wire-mesh reinforced lining. The insulating coating therefore adds $1.33 to $1.50 per bbl to the cavern cost. From this it would appear that $5.50 to $7.50 per bbl, or $1.55 to $2.12 per Mcf, would be a reasonable estimate for construction of a mined cavern with an insulating lining.

Surface Quarried Pits. The third storage scheme evolved from consideration of possible methods to prevent spalling of cavern roofs. Since liquefied natural gas can be stored at atmospheric pressure, there is no need for the cavern to be located deep below the ground. Therefore, cost estimates were obtained for quarrying a surface pit, insulating with a reinforced perlite concrete lining, and covering with an insulated steel roof.

Material Service Corporation estimated (1960) the costs for quarrying limestone at $2 to $3 per cu yd. A 285,000-bbl pit would contain about 60,000 cu yd of limestone, resulting in an excavation cost of $120,000 to $180,000. This represents 42 cents to 63 cents per bbl for quarrying.

The pit was assumed to be a flat-bottom cylinder 140 ft in diameter by 104 ft deep. The gunite contractors estimated materials and application costs for applying a 6-in. coat of wire-mesh reinforced low-density perlite cement to be $113,000. Chicago Bridge and Iron Company estimated (1959) the cost of a self-supporting steel domed roof, with a suspended thin stainless-steel inner roof and 3-ft of insulation, at $421,000. From this it would appear that the total cost of quarrying, lining and covering a surface storage pit would be between $654,000 and $714,000. Additional concrete to imbed the roof hold-down ring and the gas seal would probably increase this to $710,000 to $770,000. This would represent $2.50 to $2.70 per bbl or $0.71 to $0.77 per Mcf.

Based on the above estimates, the cost of constructing a mined below-ground cavern for storage of 1-billion std cu ft as liquefied natural gas would be between 45% and 74% of that for standard surface tanks for the same

capacity. Construction cost estimates for a steel covered belowground pit for liquefied natural gas storage are only 21% to 27% of that for equivalent capacity surface storage vessels. However, due to the almost complete lack of information on the physical and thermal properties of rocks and soils at low temperatures, it is not possible to fully evaluate the practicality of this storage technique at present.

The various cost estimates for the different storage containers are summarized in Table 2.

TABLE 2. Summary of Cost Estimates for Various LNG Containers.

	Estimated Cost per Mcf storage*
Aboveground double—wall tanks	$2.85 TO $3.42
Mined and Lined cavern	$1.55 TO $2.12
Quarried limestone pit, lined and covered	$0.71 TO $0.77
Buried prestressed concrete tank, lined	$1.25 TO $1.50

*BASIS — 1 billion SCF Total Storage

Cavern Operation

Even though the initial cost of mined or quarried containers for natural gas liquid may be considerably lower than for equivalent surface tanks, they could prove impractical if the heat influx through the surrounding rock or ground caused an excessive rate of evaporation.

To obtain an idea of the vaporization rates, the heat influx equations for a spherical cavern in an infinite medium were solved. Heat influx rates were calculated for each of three sets of thermal properties of rocks, as summarized in Table 3.

Two solutions were obtained for each rock type—for an unlined cavern, and for one lined with 6 inches of low-density perlite concrete, each designed to store 1 billion std cu ft as liquid. The results of these calculations were converted into vaporization rates, and are presented in Fig. 2. For comparison, the stated vaporization rate for the 35,000 bbl standard surface tank at Lake Charles, Louisiana, is 0.2% of the total volume per day, or 2 MMcf per day for a 1 billion std cu ft storage installation. The vaporization rate will probably be slightly lower for the 53,000 bbl tanks proposed by the Chicago Bridge and Iron Co.

As can be seen from Fig. 2, both the lined and unlined limestone, and the lined sandstone, caverns have vaporization rates of less than 2 MMcf per day after 240 days in operation, and the lined cavern based on average rock properties is approaching this value.

TABLE 3. Some Thermal Properties of Rocks.

Ref.	Substance	Thermal Cond. Btu/hr-ft F	Heat Cap. Btu/lb-F	Density lb per cu ft	Diffusivity sq. ft per hr
a.	Average rock	1.4	0.21	165	0.04
b.	Sandstone	1.06	0.22	140	0.034
b.	Limestone (15.3 vol % H_2O)	0.54	0.217	103	0.024

References

a. Ingersoll, L. R., Zobel, O. J., and Ingersoll, A. C., *"Heat Conduction: With Engineering, Geological and Other Applications,"* 288. The University of Wisconsin Press (1954) Madison.

b. Perry, J. H. (Editor), *"Chemical Engineer's Handbook. Third Edition,"* 457. McGraw-Hill Book Company (1950) New York.

One important difference between the operation of a surface tank and a cavern should be emphasized: The tank will rapidly assume a steady-state heat influx rate, whereas the cavern will initially have a very high rate which

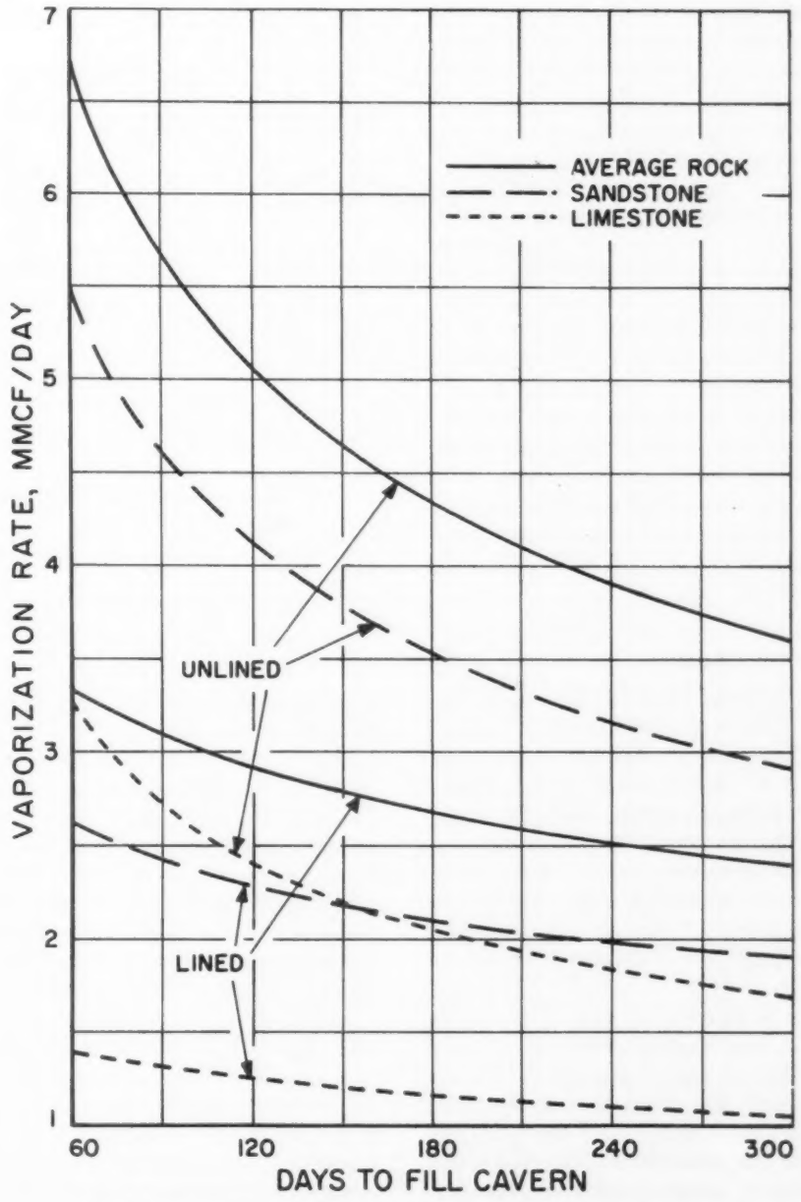

Fig. 2. Rate of vaporization of stored liquid at end of filling time.

will decrease quite rapidly at first, and continue to decrease slowly during the entire operation of the cavern. The rates shown in Fig. 2 are for the first filling cycle. The second year the rates would be considerably lower.

A better picture of the operation of cavern storage systems can be obtained by referring to Fig. 3. Here the installed liquefaction capacity to store 1 billion std cu ft as liquid is plotted versus the number of days operated to fill the cavern. The effect of rock properties and lining on the required liquefaction rate is very evident.

For example, if the installed liquefaction capacity is 10 MMcf per day, lining a cavern having average rock properties would reduce the filling time from 280 to 150 days, and the vaporization rate at the end of filling would be reduced from 3.7 to 2.8 MMcf per day. Or, if the cavern were to be filled in 280 days of operation, lining the "average rock" cavern would reduce the required installed liquefaction capacity from 10 MMcf to 6.5 MMcf per day.

All of the calculations summarized in Fig. 2 and 3 must be considered as approximations, even though rigorous analytical solutions of the heat transfer equations were used. The question enters through lack of knowledge of the variation in thermal properties of rocks and soils at low temperatures. Reference to Table 3 and Fig. 2 and 3 makes it very apparent that until accurate information is available on the changes in these properties with changes in temperature, it will be impossible to obtain other than indications of the actual behavior to be expected.

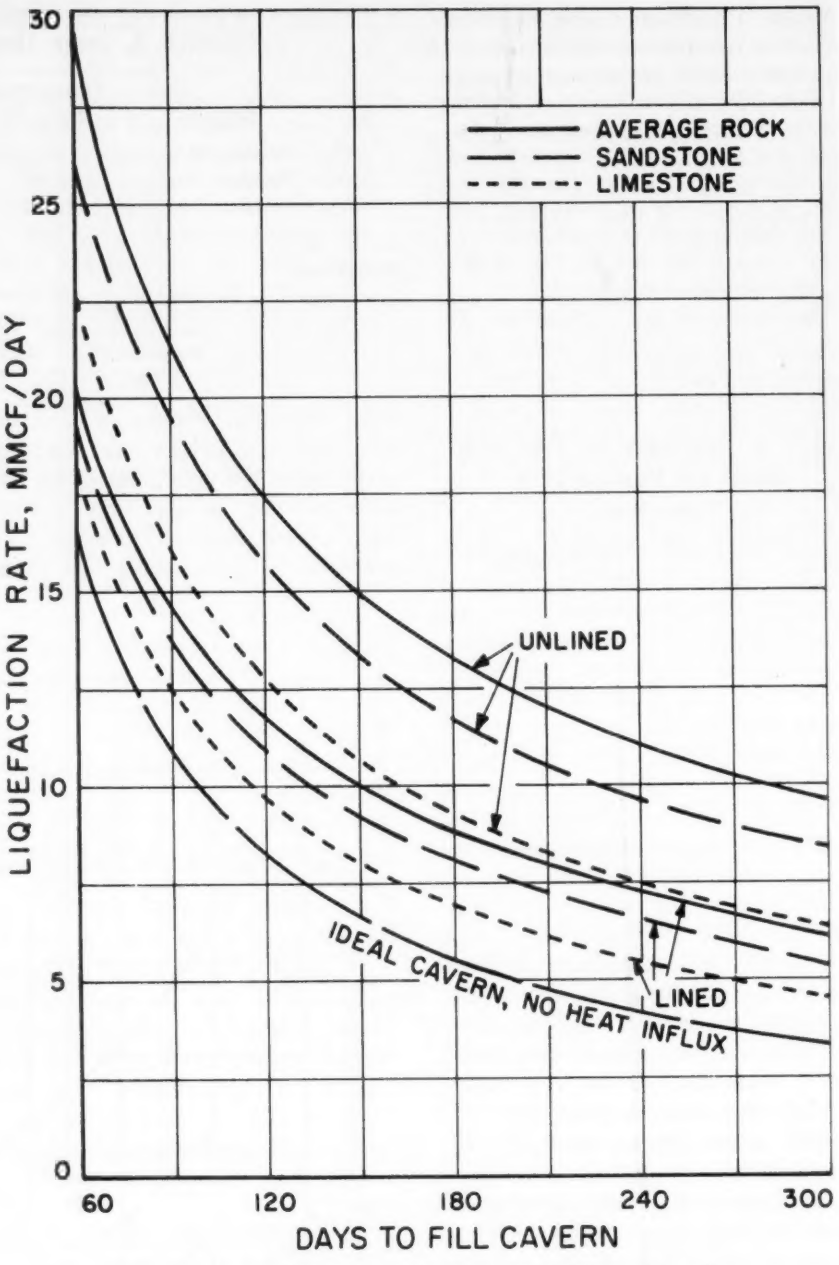

Fig. 3. Liquefaction rate required to store 1-billion std cu ft.

Future Studies

The program for the IGT study during 1960 is designed to obtain a satisfactory answer to the question of feasibility of constructing structurally sound belowground storage units for liquefied natural gas. This will require experimental determination of the effects of low temperatures (down to – 260 F) on the various physical and thermal properties of concretes, rocks, and soils.

It is planned to observe the structural and thermal behavior of scale models of surface storage pits, to determine the influx of configuration and surroundings on their performance. The information obtained in this program should permit accurate prediction of the operation of full-scale below-ground units for storage of liquefied natural gas.

Several preliminary tests have been made on the behavior of rocks and concrete when contacted with liquid nitrogen (liquid nitrogen boils at –320 F, as compared to — 250 to – 260 F for liquefied natural gas). Granite, and both dry and water-saturated limestone samples, have been subjected to direct contact by liquid nitrogen with no observed spalling or fracturing of the rock. A small, flat-bottom, thin-walled concrete vessel was constructed and filled with liquid nitrogen with no apparent effect on its structural integrity. Some of the samples have been subjected to repeated tests with no observable change. The detailed and qualitative testing program is being initiated, and the first structural model tests are underway.

Acknowledgment

This study was sponsored by the Gas Operations Research Committee of the American Gas Association with funds provided by the Promotion-Advertising-Research (PAR) Plan of the Association. The assistance and direction of the Project Supervising Committee, Mr. M. D. Crane, Chairman, is gratefully acknowledged.

This article was adapted from a presentation made at the Production Conference of the A.G.A. Operating Section, New York City, 1960. * * *

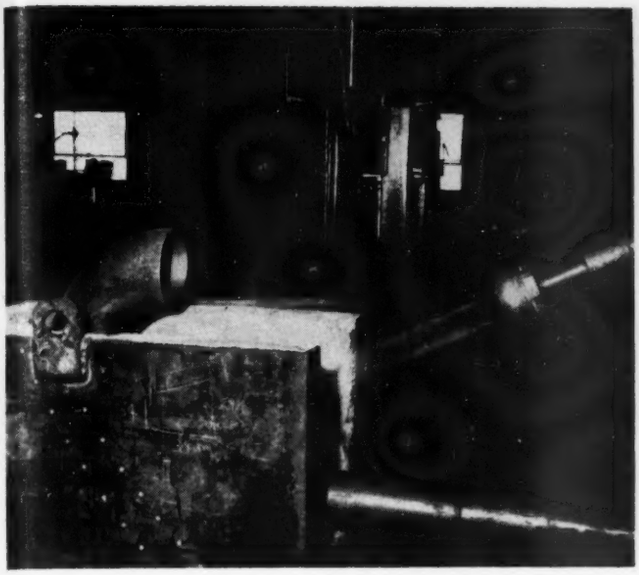

FIG. 1. Furnace for heating tubing blanks to forging temperature for forging into welding fittings.

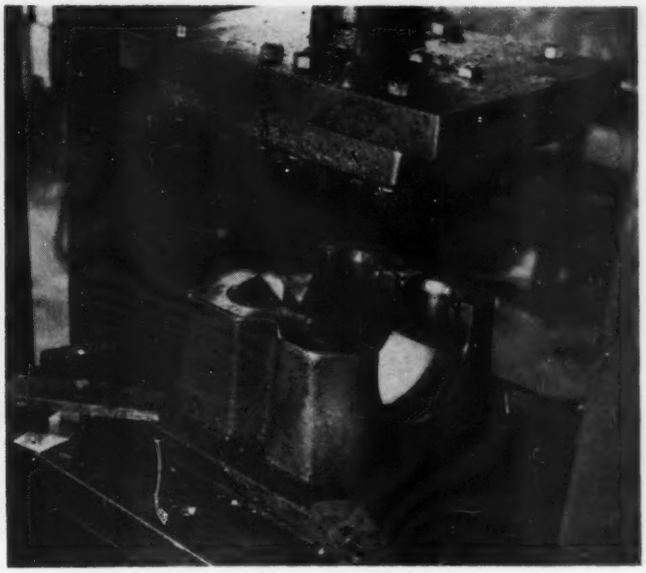

FIG. 2. Hydraulic press and forming dies for sizing fittings while still hot from furnace.

New Plant Makes Welding Fittings Using Unique Gas Furnace Design

John W. Abernathy, *Industrial Sales Manager,*
Oklahoma Natural Gas Company, Tulsa, Oklahoma

A SMALL, INDEPENDENT INDUSTRY near Tulsa, Oklahoma is invading a market generally dominated by large nationally-known manufacturers. The new industry is Flo-Bend, Inc., which recently opened a plant in Sand Springs, Oklahoma, to manufacture precision welding fittings for the oil, gas, and chemical industries.

Early in 1958, the company founders purchased the entire plant of a fitting manufacturer in Hamburg, Germany, and moved all the equipment, designs, etc., to this country.

It soon became evident that the German equipment, which had worked well in Hamburg, was not suited to the American operation. After two years of research, modification, and redesign, the present manufacturing process bears little resemblance to its German predecessor. Plant capacity is approximately double that achieved by the Germans, and designs are under development now to double this capacity once again.

Fittings produced at Flo-Bend include 45° and 90° elbows and 180° return bends in accordance with ASTM and ASA specifications. Now in production are sizes from 2-in. through 6-in. long radius bends.

The raw material for the process is a variety of sizes of seamless pressure tubing specially rolled at the steel mill to specific diameters and wall thicknesses. From storage, the tubing is moved by roller conveyor to the cut-off machine, which automatically feeds, measures, and saws the tubing to a preset length. Burrs from the sawing operation are removed by the operator before the mill preservative is removed in a heating solution. The blanks are then loaded in baskets for temporary storage at the forming machines.

The forming machine operator loads the blanks end to end on the extension of a forming mandrel. The mandrel itself is positioned in a refractory furnace heated by a single gas flame (Fig. 1). At an elevated temperature and under pressure from the machine, the blanks are pushed progressively over the mandrel where they flow into their final shape. The length of the blank determines whether the final product will be a 45°, a 90°, or a 180° bend. While still hot, each fitting is transferred to a sizing press where slight dimensional variations are corrected (Fig. 2).

The next step in the production line is the machining of each fitting to a flat face and bevel cut suitable for welding. This is accomplished by a machine that requires of the operator only the loading and unloading of the fixture. All lathe operations are automatic (Fig. 3). After one end is cut and beveled, an air-operated mechanism turns the fitting around, the other end is cut and beveled, and the machine stopped. The fittings then are inspected for mill flaws and the rough spots on both inside and outside walls are ground to a smooth finish. The parts are then blast cleaned to remove scale.

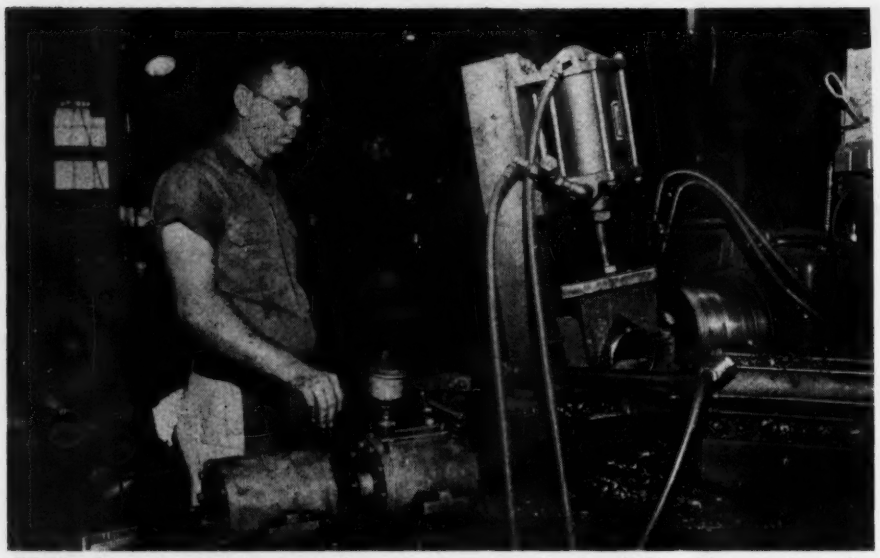

FIG. 3. Operator checks operation of automatic lathe that finishes fitting ends to flat face and bevel suitable for welding.

FIG. 4. James Close, vice president of firm, observes loading and unloading station of conveyor system used for pickling, cleaning, painting, and drying of fittings.

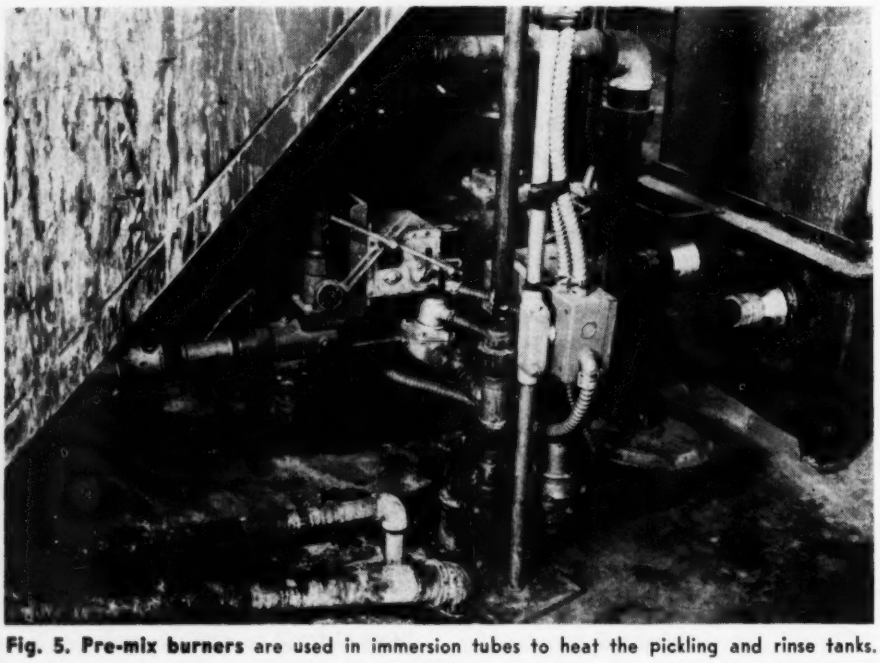

Fig. 5. Pre-mix burners are used in immersion tubes to heat the pickling and rinse tanks.

The final step in the manufacturing process is the cleaning and painting operation (Fig. 4). Here a continuous overhead conveyor system is used to transport the fittings through the pickling and rinse tanks and the paint dip tank and to allow sufficient time for drying in air prior to unloading and storage for shipment.

The pickling tanks uses a solution heated to 165 F and the rinse tank contains water at 170 F. Both tanks are heated using immersion tubes fired with Bryant combustion equipment with automatic temperature control (Fig. 5). The fittings are dip painted to insure full coverage of both inside and outside walls using a rapid dry lacquer. It air dries in four to five minutes.

One of the critical and most interesting points in the manufacturing process is the application of heat during forming. The German furnace used a combination of fuel oil and manufactured gas. This design was immediately discarded by Flo-Bend as unsuitable for their process requirements. They studied at length the use of electric induction heating equipment and visited manufacturers' plants to observe this type of equipment in operation. They finally settled on the use of natural gas due to much lower initial cost, lower projected operating and maintenance costs, and more flexibility.

The present furnace consists of an L-shaped enclosure of castable refractory supported by a steel shell with one side and the top open. As the blank enters the furnace area it reaches forging temperature due to the combined effect of direct impingement of the gas flame and of radiation from the furnace refractory. Combustion equipment consists of a Bryant pre-mix burner system with the single blast-tip burner on an adjustable angle fitting. Thomas Engineering Company, Bryant representative in the Tulsa area, aided in the application of their equipment to this process.

Flo-Bend has big plans for the future. Immediately, they plan to install new machines and furnaces to produce 8-in. through 12-in. fittings. In addition, they hope to have operational in the near future new forming machines to increase production of their present size range. They also plan to produce other welding fittings, including tees. Currently their demand has been sufficient to take the plant output with a minimum of sales effort. As production increases, a sales staff will be added. These are marks of a progressive and energetic new company intent on growth. Flo-Bend serves notice that they expect to be more than the *small* manufacturing company they are at present. * * *

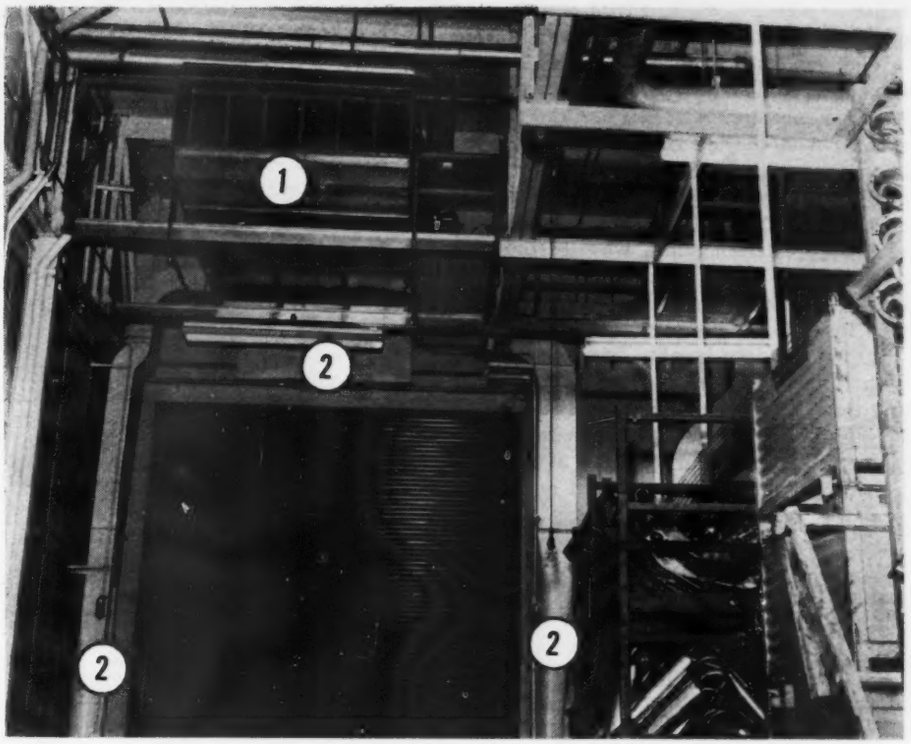

FIG. 1. **Components** of the "hot air door" system include (1) a gas-fired industrial type furnace; an air distribution system (2) with slot-type discharge openings at top and sides, and the door assembly.

Gas-Fired Hot Air 'Door' Keeps Warmth In, Cold Out

M. H. Stern, *Industrial Market Manager, Lennox Industries, Inc., Marshalltown, Iowa*

It is rare to find an industrial plant that is not equipped with several loading doors that permit raw materials or finished products to flow in and out of the plant.

Areas where the loading doors are located usually are drafty and difficult to heat properly. The magnitude of discomfort for the occupants of these areas is dependent on several factors, such as:

1. Relationship of loading doors and prevailing winds.
2. Negative pressure within the plant created by exhaust system (make-up air systems that efficiently replace exhausted air are the exception not the rule).
3. Frequency of door usage.
4. Magnitude of cracks when door is closed.

Significance of the effect caused by door openings can be appreciated when we realize that it has been estimated 1,100,000 Btu per hour at design conditions will be imposed on the heating system if a 300 sq ft door opening is used on the average of 10 minutes each hour.

Many industries confronted with this problem can tolerate make-shift solutions, but not so in the automobile manufacturing industry. The final assembly station is usually located a few feet from the "drive away door," which is operated on an average of every five minutes. If an adequate means to combat the infiltration of cold air were not provided in these areas, the health of the workers and, consequently, production would be adversely effected.

Modern heating systems can provide a practical and economical solution to this problem. It is practically impossible to prevent air from entering a heated space through an open door within the limits of practical brake horse-power ratings. But it is possible to temper this air before it causes objectionable drafts and reduces the temperature within the heated space. A system based on this principle and in use today with successful results in a modern assembly plant is described in the following comments.

The system is illustrated in Fig. 1. The components are a gas-fired industrial type furnace, air distribution system with slot type discharge openings, control system, and door assembly.

The industrial type furnace is equipped with a power type gas burner that is arranged for high-low-off input and is normally fired with natural gas. During severe weather conditions, when the primary fuel supply may be reduced, a standby propane air system is placed into operation. The changeover from one gaseous fuel to the other is accomplished automatically without adjustment to the burner.

Flexibility of fuel selection is a function of burner design and is typical of power (combustion air blower) equipment. In addition to the stainless steel heat exchanger, which permits rapid heat transfer through one thickness of metal to the circulated air, an induced draft fan is provided to discharge the products of combustion to atmosphere and permits proper adjustment of the combustion process even under adverse conditions, such as exist in areas of

negative pressure resulting from insufficient make-up air.

The air distribution system is designed to provide a curtain of warm air over the door area. The "air curtain" is created with the aid of slot discharge openings as illustrated in Fig. 1 and 2.

Fig. 1 shows three air slots, one located at the top of the door and one at each side extending half way up the door height. If the door construction doesn't permit the use of a top air slot, then the side outlets extend the entire length of the door height. The absence of a return duct system is noticeable and the efficiency of the system could be slightly improved if it were possible to locate a return air opening at the base of the door, but this is not practical for industrial applications.

Fig. 2 is a section view of the door area and illustrates a design technique that was learned from practical experience. It will be noted that the air slots are aimed at the center of the door width. This design pointer results in more efficient blanketing of the door areas as compared to a slot opening that discharges parallel to the face of the door. The size of the ducts are determined by conventional methods.

Slot design is adequately covered in various publications and supplemented with information contained in the "Industrial Direct Fired Application Manual" published by Lennox Industries, Inc. The design of the tapered duct to which the side slot openings are secured is important. Erroneous design will result in erratic slot velocities and cause inadequate coverage of the door area.

Frequent operation of loading doors require proper selection of a control system so that satisfactory results will be obtained from the heat source and the air distribution system. It has been learned from practical experience that the control system should be arranged to provide the following features:

1. **The fuel burning device** should be arranged for three position input (high-low-off) and remain on low fire when the outdoor air temperature is below 50 F.
2. **A door switch** is mounted on the door and is actuated when the door is opened by automatic or manual means. When the door switch contacts close, the burner is positioned to high fire to impart the maximum temperature rise to heated air.
3. **The industrial type furnace** located in an area that is under extreme negative conditions should be equipped with motorized, automatic, fresh and re-circulation air dampers. As the burner is positioned to high fire, fresh air is introduced into the negative area in an attempt to eliminate this objectionable condition, which amplifies the draft problem.
4. **The blowers** are operated continuously, and are only de-energized if the system is in-operative, due to a burner failure.
5. **A thermostat** to sense room temperature may be provided, in addition to the door-actuated switch, so that either device can operate the system as a function of room temperature or door operation.

The style and dimensions of the door being used will determine the location of the air slots and capacity of the system in Btu per hour output and air handling ability. The air slot design velocity is primarily determined by the door width and should not be less than 2000 ft per min.

All door areas don't require the refined system described in the preceeding paragraphs. Truck loading docks such as illustrated in Fig. 3 can be adequately heated with industrial type heaters and conventional control systems. The air distribution system can be discharge air nozzles as illustrated, which is a simple and inexpensive method of directing the heated air.

Infiltration of unheated air into industrial plants can be a large source of heat loss and impose unnecessary demands on a new or existing heating systems. An economical solution can be found in the versatile gas-fired industrial type furnace. * * *

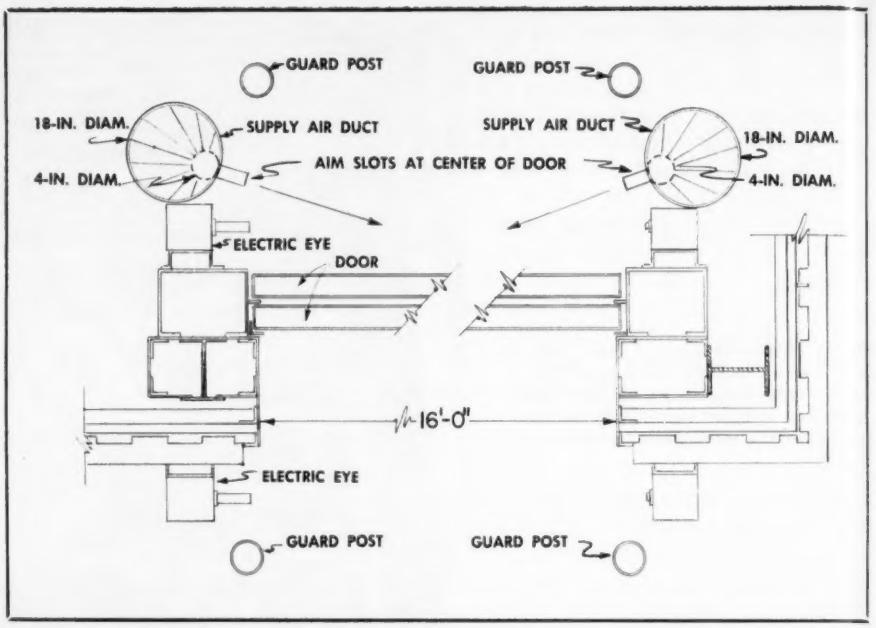

FIG. 2. **Design technique** developed from practical experience is shown in section view of door area.

FIG. 3. **Not all door areas require special, refined systems.** Typical truck loading dock equipped with industrial type heaters and conventional control systems, uses discharge air nozzles as shown.

Independent Insurance Consultants . . . Their Role in Modern Business

C. Charles Burns, *Consultant, Commonwealth Services, Inc., New York City, New York*

NOT SO MANY YEARS AGO, people tended to look upon insurance as a sort of uneven game of chance, conceived by mathematicians who set the odds, at the expense of premium payers. Time, education, and the pressure of competition between insurance companies have helped to change this greatly distorted image. But the residues of mystery still persist, for insurance is a complex, technical subject. And the business explosion since World War II has greatly increased this complexity. This poses a challenge for the corporate buyer of insurance since his understanding of the mechanism and techniques of insurance must be of a high order if he is to perform his duties effectively. Assisting and advising him in the development of sound progress is the *independent insurance consultant.*

Consultants Are Not "Brokers"

We use the word "independent" to emphasize an important distinction. The simple appellation "consultant" is frequently applied to staff members of insurance companies and to commission agents and brokers whose advisory services are incidental to their sales of insurance. These persons derive their compensation from the insurance company and thus do not qualify as "independent."

The truly independent insurance consultant is compensated ONLY by the client he serves.

A broker or agent may well be in the picture also and receive a commission on the sale of the insurance, but this is of no concern to the independent consultant. The consultant justifies his existence on the conviction that objectivity and strict impartiality are essential to the solution of insurance problems, and that these qualities may be diluted if the specialist serves two masters.

Some insurance brokerage firms act as consultants for a fee and set up for this purpose a department which is divorced from their selling activities. Such arrangements would seem to qualify under the definition of "independent insurance consultant" provided the departmental lines are clearly drawn and scrupulously observed. However, a consultant who is also licensed to sell insurance may agree to accept the insurance commissions in place of his fee for advisory services.

This practice raises delicate questions. Because of the possibility of conflict of interest, those who seek the services of insurance consultants, especially governmental bodies, may ask for a certification that the consultant is neither a licensed insurance agent or broker nor associated with any organization engaged in selling insurance.

Clearly, a strong case can be made for an insurance buyer to shop for advisory services at a counter as far removed as possible from the actual point of sale.

Three Areas of Consultation

The insurance consultant to business firms operates in three principal areas: General Insurance (embracing all forms of property insurance, workmen's compensation, legal liability, fidelity, and other lines), Employee Benefits (group life and health insurance coverages), and Pension Services (trust-funded and insured retirement programs).

Because of the peculiar, specialized knowledge required in each of these fields, it is rare that a single consultant will be expert in all of them. Consequently, separate individuals will ordinarily cover these branches, although the last two named may adequately be handled by the same consultant since they have a number of features in common.

● The **general insurance consultant,** more often than his counterpart in the other areas mentioned, is able to save his client money and do so in a comparatively short period of time. Given free access to his client's premises, he conducts a thorough-going survey of every phase of his operation and designs the program he feels best suits his client's situation.

His tools are an intimate acquaintance with the hazards peculiar to the business, a shrewd instinct for the appropriate coverages and an up-to-the-minute knowledge of the markets in which his risks can be most advantageously placed.

When an unusual type of risk is involved he must often use ingenuity and sound judgment to persuade a reluctant insurance company to discard antiquated underwriting notions and accept a particular risk. As already indicated, the results of his work are often readily measurable in actual premium savings, or broader coverage for the same premium, which operate to offset the cost of his services.

There are, of course, other, more intricate and less immediately cost-reducing phases of the general insurance consultant's work. For example, he may be called upon to help solve problems in less familiar fields, such as those posed by nuclear hazards in industry. Here, because of the novelty

of the questions presented and the enormity of the risks involved, he proceeds cautiously and deliberately and the fruits of his labors are frequently slow to manifest themselves. Or, he may be engaged in the design of a special "all-risk" type of policy which, though time-consuming and laborious, may result in savings of thousands of dollars because hazards were covered which previously had been thought uninsurable.

The markets in which he places his risks are both in the United States and abroad; his contracts in these markets must be widespread and his reputation for competence and integrity first-class. Finally, this insurance consultant may be helpful in reducing insurance costs or preventing them from rising by counseling his client in the effective use of loss prevention and safety engineering techniques.

● By contrast with the general insurance consultant's role, that of the **employee benefits consultant** is less patent in its premium-saving possibilities. Premiums in his type of insurance are in nearly all cases determined by the operating experience of individual groups, so that cost reduction must be accomplished by lowering claims expenses or the carrier's retention, or both.

Where the consultant finds that more premiums are being paid than are needed to meet the current year's claims and expenses, and dividends are accordingly high, an adjustment can be made with the carrier which not only improves the client's cash position but also saves him unnecessary retention costs. Nevertheless, the actual claims experience under any plan will be the principal determinant of the true cost of such plan.

An important, and disheartening, factor bearing on benefit plan costs today is the problem of monetary inflation which perpetually increases the cost of medical care. As though this were not enough to contend with, a plan also faces the surcharge of overutilization of benefits. If it cannot control the manner in which its benefits are utilized, a plan can not long survive the combined pressures working to undermine its stability.

It is in the maintenance of the plan's fiscal soundness that the consultant can render an important service. This is done by instituting a system of claims control to detect areas of improper utilization; for example: Malingering, unnecessary hospital confinements, excessive surgical charges, and so forth. The probable areas of trouble can usually be identified through use of specially adapted statistical techniques and corrective measures thereupon devised.

As already indicated, the insurance carrier's retention charge is a proper subject of the consultant's scrutiny and, if it is found excessive, an adjustment can be negotiated. This area of investigation is usually a sensitive one for the analyst because carriers tend sedulously to preserve from disclosure the detailed make-up of their retentions.

Frequently, the consultant's analysis reveals that health plan benefits are not provided on a uniform basis. For example, some employees are found to have been reimbursed a higher percentage of their incurred claims than others. Not only is this a wasteful use of available premium dollars, but it can cause employee dissatisfaction.

The problem faced by the group's administrator is how to measure the benefit effectiveness of his plan and in this task the consultant is well equipped to help him. In the solution of the problem, the consultant helps the administrator set up an appropriate system of record keeping so that he has available at all times the data needed for periodic statistical analyses. Evaluation of this data will determine whether the group's objectives are being met and, if not, what changes are advisable to obtain the desired reimbursement levels.

● The **pension consultant's** role is already a very familiar one, especially to firms whose retirement programs are financed under a trust-funded plan. His services in such cases are virtually indispensable due to the intricate nature of pension plans and his unique ability to give them continuing technical guidance. At times this consultant is an accredited actuary and in this capacity he is more appropriately referred to as an *actuarial consultant*. He is, of course, also active in connection with plans financed through an insurance company, but far less today than he was in the 1930's and 40's when most of the pension business was in the hands of the insurance companies. Nowadays, trust-funded pension plans hold the ascendancy so that the appellation "insurance consultant" may seem somewhat dated when referring to the modern pension practitioner.

The cost savings aspects of the pension consultant's work lie principally in his ability to control the incidence of cost to his client so that outlays can be planned with a view to effecting maximum financial economies and tax savings. The actual cost of a pension plan is, in the final analysis, the amount paid out in benefits plus the cost of administration. The pension consultant can, however, by selecting the appropriate method of funding and financing the plan, regulate the manner in which these costs are met and thereby save his client from making expensive mistakes.

The pension consultant, in addition, advises on the benefit structure and administrative procedures of a plan and designs modifications from time to time to suit the changing needs of his client. He is abreast of pertinent tax laws and frequently a keen securities analyst. His range of knowledge is wide and deep, and he must possess wisdom and sound judgment for he advises on matters that affect significantly the continuing well-being of employees.

Where To Find Consultants

We have illustrated the role of the insurance consultant in the three principal branches of his activity and highlighted a few of the services which he is peculiarly equipped to render the business firm. In concluding this brief discussion, we should perhaps turn for a moment from the question of what he does to how he is organized to do it.

In general, the independent insurance consultant will be found operating in one of three forms:

1. As an individual practitioner,
2. As a member of a firm of insurance consultants, or
3. As a specialist in insurance within a larger firm of management consultants offering a wide range of advisory services besides insurance.

The advice seeker whose problem is restricted to the field of insurance will be well served by any of these types of organization. An aspect of particular interest is raised, however, where the problem at hand transcends the confines of insurance. This factor is nearly always present when the assistance sought is in the broad field of employee benefits, for here there are many forces at play, notably, industrial relations, economics, finance and taxes, all of which must be brought to bear on the problem with the greatest skill.

Obviously, these larger questions require attention not only by the insurance consultant but by practitioners in these other fields as well and the integrated management consulting firm can be of particular help in this type of situation. In such firms the insurance consultant and his colleagues work together to provide a coordinated approach designed to yield the very highest quality of service for his client.

The seeker of consulting services should, therefore, select his consultant with great care, preferably visiting his place of business and conferring with him alone and, where the occasion warrants, together with his associates whose participation will be required. If he does this, he will have taken a long step in satisfying himself that his problem will receive expert attention.

* * *

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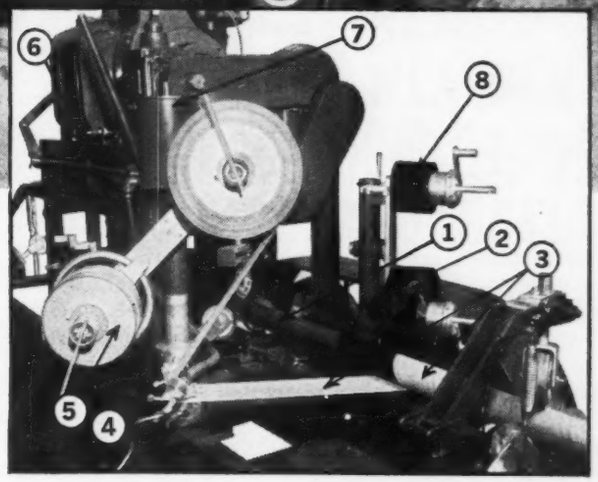

Pipe (coming toward you) spins through machine . . . undergoes dynamic cleaning from twin-powered brush heads. Coating comes off brake-type tape drum. Outer wrapping runs through fast-gluing adhesive attachment.

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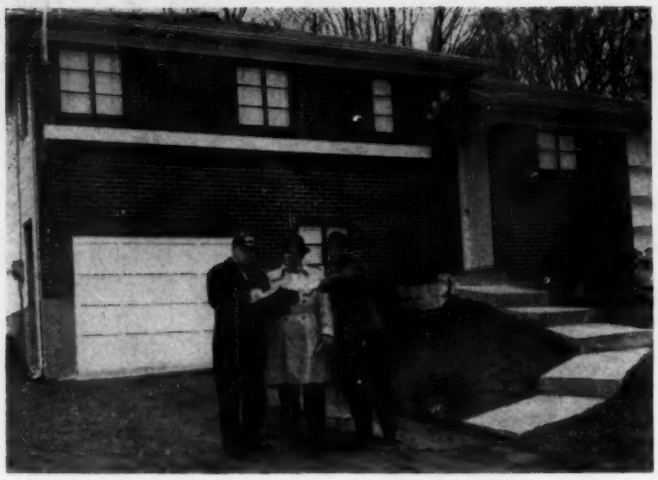

House that looks like all the other private homes in the Yorktown area of Westchester County lives a double life. Deep inside, it's really a gas measuring station for Consolidated Edison Company of New York.

Metering equipment, in the garage, is checked daily by a Con Edison inspector. Above, changing charts on the flow and pressure recorders are Howard Secor and Ray Kulikowsky. Looking on is Wesley Walker, Con Edison business representative in the area.

Nobody here but us meters and regulators

A House Is Not Necessarily A Home . . . Especially If It's A Gas Metering Station!

Dean Hale, *Editor*

IN WESTCHESTER COUNTY, New York, there's an attractive brick veneer house with a well-kept lawn where lights go on at dusk and out by midnight, and to all appearances it is occupied by a typical American family.

Except that it isn't.

In reality, it is a gas metering station for Consolidated Edison Company of New York. It is one of several the company has in the Westchester area.

The station is located in a realty development in the residential district of Yorktown. The main line of Con Ed's supplier in the area, Algonquin Gas Transmission Company, runs through this property. When the area was being developed, Con Edison purchased an attractive brick veneer house located on a spacious wooded lot and converted it to a gas metering station.

Upstairs, the house is unfinished, but for all outside appearances, it gives the impression of being occupied. Control equipment turns on lights inside the house at sunset . . . and the lights can be seen through the house's venetian blinds. The lights are automatically switched off before midnight.

Water service was brought to the house in order to maintain the lawn and shrubs. Gardners perform the mowing and pruning chores. Neighbors of the "house" have complimented the company on the way the house and lot are kept.

In the garage-basement area of the house, though, you won't find a new car, laundry equipment, and other household paraphernalia. Instead, there's an ample selection of metering and pressure regulation equipment.

Gas received from Algonquin arrives at a pressure from 300 to 600 psi, with the average delivery pressure about 500 psi. Inlet pressure is reduced in two stages. The first stage reduction takes the pressure down to 95 psi. The second stage reduces pressure to the sendout level of 30 psi. Gas at this pressure is then introduced in the steel mains of the Yorktown distribution system. The regulators are of a conventional modern type.

Daily average sendout of the station during the winter varies between 100,000 and 200,000 cu ft. During the summer, the average sendout may drop as low as 20,000 cu ft per day.

In addition to the equipment in the basement of the house, the back yard of the residence houses a heat exchanger completely surrounded by a cedar fance—woven and rustic looking—that hides the equipment from passers by.

The exchanger heats the gas, which arrives at ground temperature (approximately 35 F). As the gas expands through the regulator valves, its temperature drops to approximately 10 F and occasionally goes down to 0 F. To prevent moisture from collecting on the piping and freezing, and possible hydrate formations inside the piping, the gas-fired exchanger heats the gas to 45 F.

Operation of the station is very quiet. There are no noises to disturb the serenity of the neighborhood. A meter reader visits the house once each day at 1:00 p.m. to check the building and to change charts.

The station was designed with sufficient capacity to meet the area's growth for some time. Gas mains and services were not installed in the area until most of the homes in the development were built. But expansion of the area is expected and the station will be able to accommodate extensive growth. The distribution system is a closed system so all new customers will be taking their gas from the "house that's really a measuring station."

* * *

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Questions & Answers on New Tax Reporting

Every gas company will need to make detailed report on income tax returns for taxable years after December 31, 1959; here's a quick resume of what's expected

Paul Lockwood

TAX ABUSES in entertainment and employee expense account reporting have continued even with the recent crackdown of the Internal Revenue Service.

So . . .

The Commissioner of Internal Revenue is asking for more detailed reporting on income tax returns beginning with 1960. Employee returns will be the same, but employers will be required to submit more detailed reports.

Here are some questions and answers on employer reporting of employee's expenses:

QUESTION: *Does the regulation cover all types of business organizations?*

ANSWER: Yes. The regulation applies to all employers such as corporations, partnerships, and sole proprietors. However, the details vary with the form of organization.

QUESTION: *What are corporations required to do?*

ANSWER: On Schedule E of Form 1120 for corporations, the section "Compensation of Officers" is being expanded. In addition to the payments designated as compensation, all expense account allowances paid to or on behalf of the officers must be reported.

QUESTION: *Does this expense reporting apply to all officers of the corporation?*

ANSWER: Yes. The information will be required of all corporate officers. If there are more than twenty-five officers, however, it then applies only to the 25 highest paid officers. The highest paid officers are determined by the total of their compensation plus expense account allowances.

QUESTION: *What are partnerships required to do in this new reporting procedure?*

ANSWER: Form 1065 for Partnerships will be expanded similar to the corporation form. It will require similar information to be reported about all partners. This includes limited partners of the firm.

QUESTION: *What are sole proprietorships required to do under the provisions of this new reporting?*

ANSWER: Schedule C of Form 1040 for Individual Proprietorships will require similar information. This reporting covers the owner of the business and his five highest paid employees based on the total compensation plus expense account allowances.

QUESTION: *Are there any exemptions to this rule for small firms?*

ANSWER: Yes. This detailed reporting is not required for employees who receive less than $10,000 including compensation and expense account allowances paid to or on behalf of them in one taxable year.

QUESTION: *What does "expense account allowances" mean in this regulation?*

ANSWER: Basically, it covers two areas of payment by the tax reporting firm:

1) Money received as advances or reimbursements other than regular compensation.

2) Money paid by the firm for expenses incurred by or on behalf of an officer, partner, employee or owner. This includes all amounts through any type of credit card.

QUESTION: *Will there be any other new information required by this new regulation?*

ANSWER: Yes. You will be required to report if you claimed a deduction for:

1. Recreation facilities including a hunting lodge, ranch or farm, fishing camp, or resort property.
2. Accommodations for customers, officers or employees including family members such as a hotel room or suite, apartment or house.
3. Convention or business meeting expenses of family members of officers or employees.
4. Vacations for officers or employees or members of their families, but not vacation pay reported on Form W-2.
5. Boat or yacht used for entertainment of customers or personal use of officers, employees or their families.

QUESTION: *How much detail is necessary on reporting these expenses?*

ANSWER: The reporting on the employer's income tax return will show a dollar amount for employees.

According to Revenue Ruling 59-396, however, the employee must be required to submit written statements to the employer. These statements must show the "business nature and the amount of expenses incurred, broken down into broad categories, such as transportation, meals, and lodging while away from home overnight, and other business expenses."

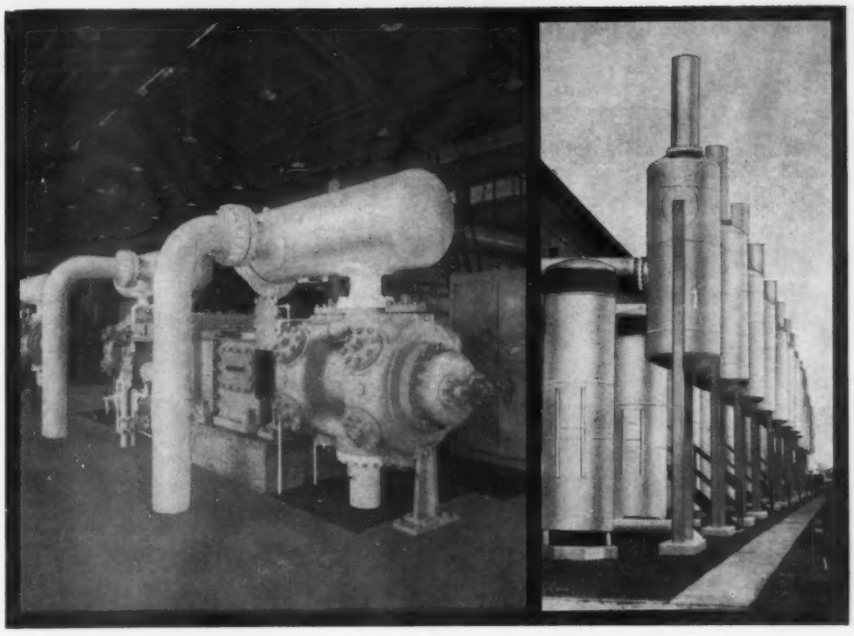
QUESTION: *Can a per diem expense allowance be used?*

ANSWER: On the new reporting section, you do not detail the basis for allowances. You will save time and trouble for yourself and your employees, however, when you adopt a per diem and mileage allowance.

If your per diem allowance is no more than $15 a day and your mileage allowance is no more than 12½ cents per mile, your employees do not need to account for this on their income tax return.

QUESTION: *Is it absolutely necessary to complete the new sections on expense accounts on the income tax return?*

ANSWER: There is no penalty for failure to complete this section. It is fairly obvious, however, that since the Internal Revenue Service is using this to stop abuses, they will check it. Failure to complete the section will probably lead to a more thorough examination of your income tax return. ★ ★



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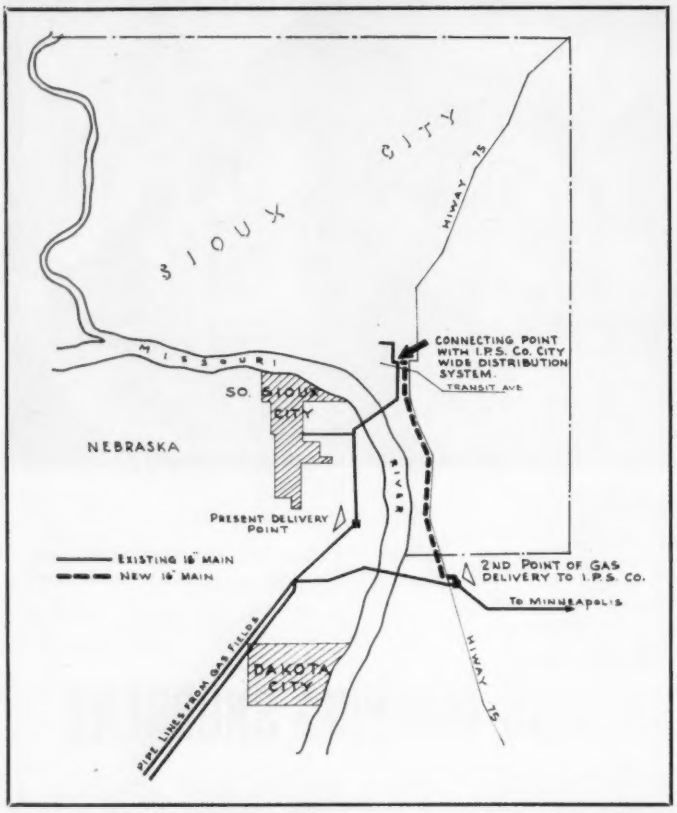

◊ **Route of 15,000 ft, 16-in. supply main** and location of delivery station in the Sioux City, Iowa area, being built by Iowa Public Service Co., is shown on map.

Contractor's crews lower-in section of 10-in. line in wet rocky location alongside highway on route of new supply line for Central Hudson Gas & Electric Corporation. Largest single project in company's 1960 project, the $1,100,000 line links two other CHG&E lines between Tuxedo and Highland, and between Selkirk and Kingston. Contractors on the job were Joseph Scholl, Inc., Philadelphia, and C. N. Flagg and Company, Meriden, Connecticut.

Iowa Public Service Company, Sioux City, Iowa, has construction underway on a natural gas line and metering station to provide a second source of gas for the city of Sioux City and at the same time help protect the system against any outage from pipeline failure. The new line, approximately 3 miles long, ties in to a second pipeline of Northern Natural Gas Co. which crosses the Missouri River just south of Sioux City near highway 75 (see map). A border gate station will be built just north of the King of Trails motel on highway 75. From this point, the duplicate supply of natural gas will flow to Sioux City through a 16-in. line laid alongside Highway 75 and connect with company's existing system at Warrington Road. Estimated cost of the border station is approximately $46,000; the mains, valves, and fittings, $188,000, and the land $3,000.

New York State Electric & Gas Corporation, Binghamton, New York, has just completed a new distribution system in Morrisville in company's Oneonta division. Approximately 6 miles of mains were installed to serve the village; gas is being supplied from a New York State Natural Gas Co. transmission line. New regulator station has been built to monitor the flow of gas. Contractor was Consolidated Gas & Service Co. of Syracuse.

Milwaukee Gas Light Company, Milwaukee, Wisconsin, has received authorization from the Clintonville council (which had designs on a municipal gas system) to install and distribute natural gas. At Tomah, company plans to install a 30,000-gal storage tank to replace present butane with propane-air-gas and ultimately natural gas. Milwaukee has authorization from the PSC and plans to purchase the Wisconsin Rapids City Gas Co. for $37,000 and convert services there from propane-air to natural gas service. Purchase of City Gas is part of a transaction in which MGL will also acquire Wisconsin Rapids Gas & Electric Co. and City Gas Service, Inc. Gas & Electric is the parent firm of City Gas and City Gas Service.

Peoples Natural Gas Division of Northern Natural Gas Co., Omaha, Nebraska, has construction underway on new distribution systems in 9 cities in Iowa and Minnesota. In Delhi, Iowa, approximately 28,700 ft of ¾, 1¼, 2 and 3- high and intermediate pressure mains and services are being installed by contractor R. E. Reutzel Co. Also in Epworth and Farley, Iowa, Reutzel has the contract for installation of approximately 31,300 ft and 51,600 ft, respectively, of ¾ thru 3-in. high and intermediate pressure mains and services. Both systems are scheduled for completion in late October. Reutzel also holds the contract for new distribution systems in LaPorte City, Denison, and Earlville, Iowa. Involved are 86,700 ft of ¾- thru 6-in. in LaPorte City; 211,400 ft of ¾- thru 6-in. in Denison, and 40,900 ft of ¾- thru 3-in. in Earlville. In Minnesota, at Twin Lakes, approximately 4500 ft of ¾ and 2-in. mains and services have just been installed by Underground Construction, contractors. Underground has also completed the system at LaCrescent involving 100,000 ft of ¾- thru 6-in. Construction is underway on a system at Maquoketa, Iowa, consisting of 21,100 ft of ¾- thru 4-in. mains and services; Brad Schnitjer Construction Co. is the contractor.

Iowa Power & Light Company, Des Moines, Iowa, has received a new 25-year gas and electric franchise to serve the area of Des Moines. Company had sought a vote on the franchises on the ground that they were of doubtful legal standing and hindered its financing.

Wisconsin Michigan Power Company, Appleton, Wisconsin, has asked the Public Service Commission for authority to spend $287,520 for construction of a new gate station and gas supply line to meet Appleton's growing gas needs. Approximately 18,000 ft of 10 and 8-in. main will be installed.

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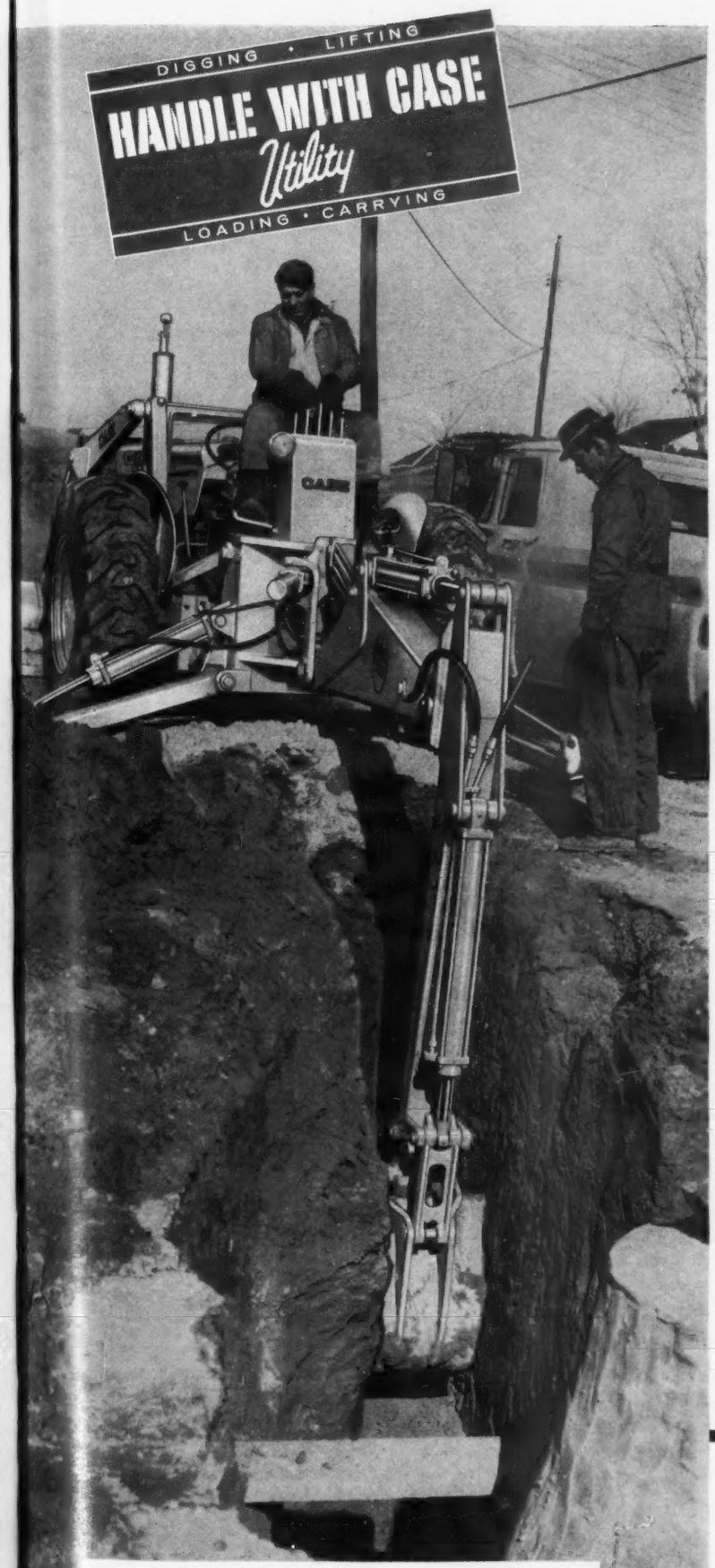

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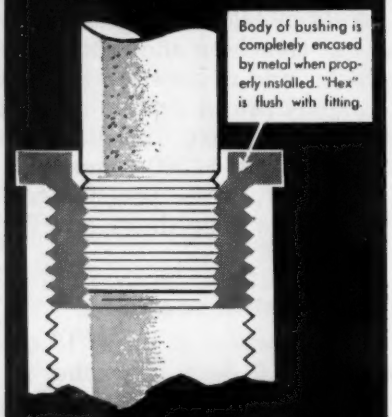
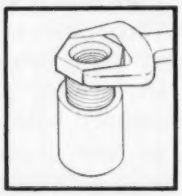


Stop Electrolysis!

■ Sandwiched between two dissimilar metals, Mayco nylon dielectric bushings prevent metal to metal contact – stop *electrolytic* action!

Able to withstand pressures in excess of 1000 lbs. and temperatures over 300°F, Mayco dielectric bushings gain added strength from clamping action of surrounding metal.



Most sizes also available with extra-heavy "Hex" to facilitate use of ordinary wrench.

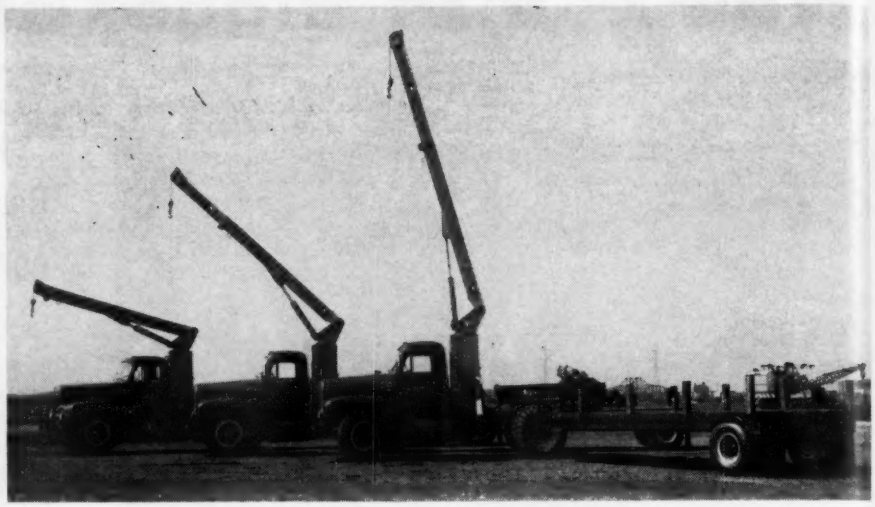
Couplings and unions also available factory equipped with Mayco bushings.

Order Mayco Dielectric Bushings from your jobber or write to:

MAY PRODUCTS, INC.

BOX 427, GALESBURG, ILLINOIS

Manufacturers of: MAYCO dielectric fittings and MAYCO water softeners and filters



Peoples Gas Light & Coke Company, Chicago, has added three new heavy-duty semi-trailer trucks to its fleet of equipment. The new units, with three times the hauling capacity of older equipment, feature a new development in equipment—hydraulic cranes behind the cab section. The built-on cranes facilitate loading and unloading of street equipment and materials such as pipe, valves, fittings, meters, etc.

In photo above, three different positions of the hydraulic cranes — and extensions of the boom — are shown. In photo at left, a group of Peoples Gas' distribution department drivers receive instruction on controls for the hydraulic cranes. Below, drivers are given opportunity to practice driving the new equipment through an "obstacle course" before it is placed in service.

Developments

Indiana Gas & Water Co., Inc., Indianapolis, Indiana, plans a $2,000,000 major expansion program in natural gas service to central and southern Indiana communities. Construction of a 11.5 mile supply line and new distribution systems is underway to serve three communities where franchises were recently granted. Gas service to portions of these communities is scheduled for November. Feasibility surveys in 6 other towns have been completed and engineering surveys are now in progress. If company decides to offer gas service and franchises are granted, construction of service facilities will begin early next spring.

Lone Star Gas Company, Dallas, Texas, plans to extend natural gas service to Coppell and Sachse. Approximately 200 families will be served in Coppell from the Fort Worth division; and approximately 400 people in town of Sachse which will be served out of the Garland district. Construction has recently been completed on a 6-in. 6.2-mile main from Broken Bow, Oklahoma, to serve an industrial customer, Dierks Forests, Inc. Estimates are that the insulation board manufacturing plant will use approximately 400,000 cu ft of gas per day to dry boards in a direct gas-fired dryer.

Atlanta Gas Light Company, Atlanta, Georgia, has three construction projects underway. The $600,000 24-in. belt line project aimed at insuring adequate supplies of natural gas for metropolitan Atlanta area is well underway. Project involves 24,400 feet of 24-in. steel main from the junction of DeKalb Industrial Way and Lawrenceville Highway to the junction of Memorial Drive and Candler Road. At the Riverdale refrigeration storage plant, liquid propane began flowing into the first new 1,290,000-gal tank September 7; the second new tank began fill about September 20. The two new tanks will boost the Riverdale plant total storage capacity to 6,500,000 gallons, or the natural gas equivalent of about 480,000,000 cu ft. All refrigeration machinery is completed, so is the compressor building. New compressor is in position and will be tested this month; a third vaporizer is nearing completion and will be tested later during trial run of the entire plant.

In a third project, Atlanta Gas Light is installing about 30,000 ft of 2-in. main to serve Waco, Georgia, a small town less than a mile west of Bremen. Located in Haralson County, the community will be serviced out of company's Carrollton office. Initially 130 customers will be served.

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With an Allis-Chalmers utility tractor . . . you move into the stockpile, reverse and spot the load . . . quickly, smoothly. Steering wheels turn sharply . . . power steering provides the muscle. Work on uneven surfaces with good stability because the wheels are spread out and wheel base is long.

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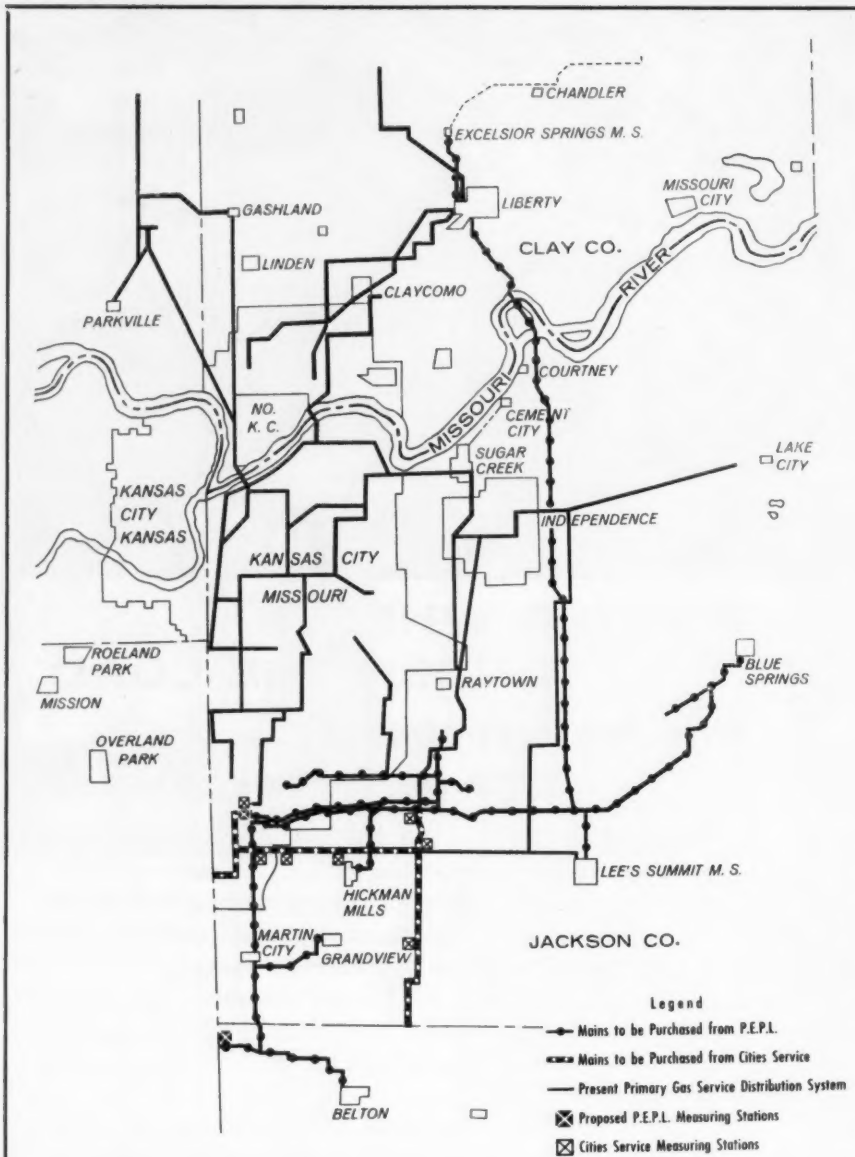
Distribution Developments



The Gas Service Company, Kansas City, Missouri, in a tri-company transaction involving $1,000,000, has purchased 100 miles of mains and related facilities in the greater Kansas City area from Panhandle Eastern Pipe Line Co. and Cities Service Gas Co. Facilities acquired from Panhandle Eastern include 81.9 miles of 1 to 10-in. mains, six regulating stations, 25 combination measuring and regulating stations, 66 farm taps and meters, etc. Facilities acquired from Cities Service include a total of 20.4 miles of lines in Jackson County in 4, 12, 16, and 26-in. sizes along, with 14 combination meter and regulator stations.

Company also has construction underway on three Kansas distribution systems in Elwood, Troy, and Wathena. As a result of a temporary order granted by FPC to Cities Service Gas Co. to build a transmission line from St. Joseph town border station around the west side of that city and across the Missouri River on the Pony Express (U.S. Highway 36 bridge into Kansas, Gas Service Co. is building the distribution systems within the 3 communities and has awarded a contract to build connecting lines to the pipeline taps to Mitchell Construction Co. Inc., Wichita, Kansas.

Northern Indiana Public Service Company, Hammond, Indiana, has construction underway on new distribution systems in Walkerton, Wakarusa, Milford Junction, Monticello, Bourbon, Reynolds, Remington, Syracuse, North Liberty, Fowler, Wolcott, Knox, Kentland, Goodland and Ligonier. Company has secured gas franchises for the communities of St. John, Lowell, Hebron, Medaryville, and Pierceton. New distribution systems have just been completed, and natural gas is now being supplied in the communities of Royal Centre, Atwood, Culver, Monon, Kouts, North Judson, Mentone, Etna Green, Francesville, La Grange, Ogden Dunes, Bristol, and Waterford.

Washington Gas Light Company, Washington, D. C., has completed a 907-ft dual line crossing of the Occoquan Creek. The 12-in. lines were tied in with the Woodbridge line begun earlier this year and natural gas is now flowing from WGL's existing system in Fairfax County to company's new franchise area in Prince William County. Line laid to Woodbridge is a single 12-in. line on both sides of creek, but becomes two lines at this water crossing only. One section will be "on line" with the single pipeline on both sides of the creek and the other section offset about 10 ft. Coated pipe in 40 ft random lengths was used for the water crossing. Contractor was Pace-Bower Construction Co.

The MINIATURIZED-PRECISION WILKINSON Line Locator Model W-3

This radically new, super-powered, transistorized instrument weighs only four pounds and is one-fourth the size of conventional pipe locators.

It is as handy as a flashlight; the maintenance is trivial; the non-leak miniature batteries last ten times longer. Long-life transistors eliminate replacement. Molded glass fibre cases. Transistor ear set. Telescopic handle. Etches circuitry. Contained in carrying case.

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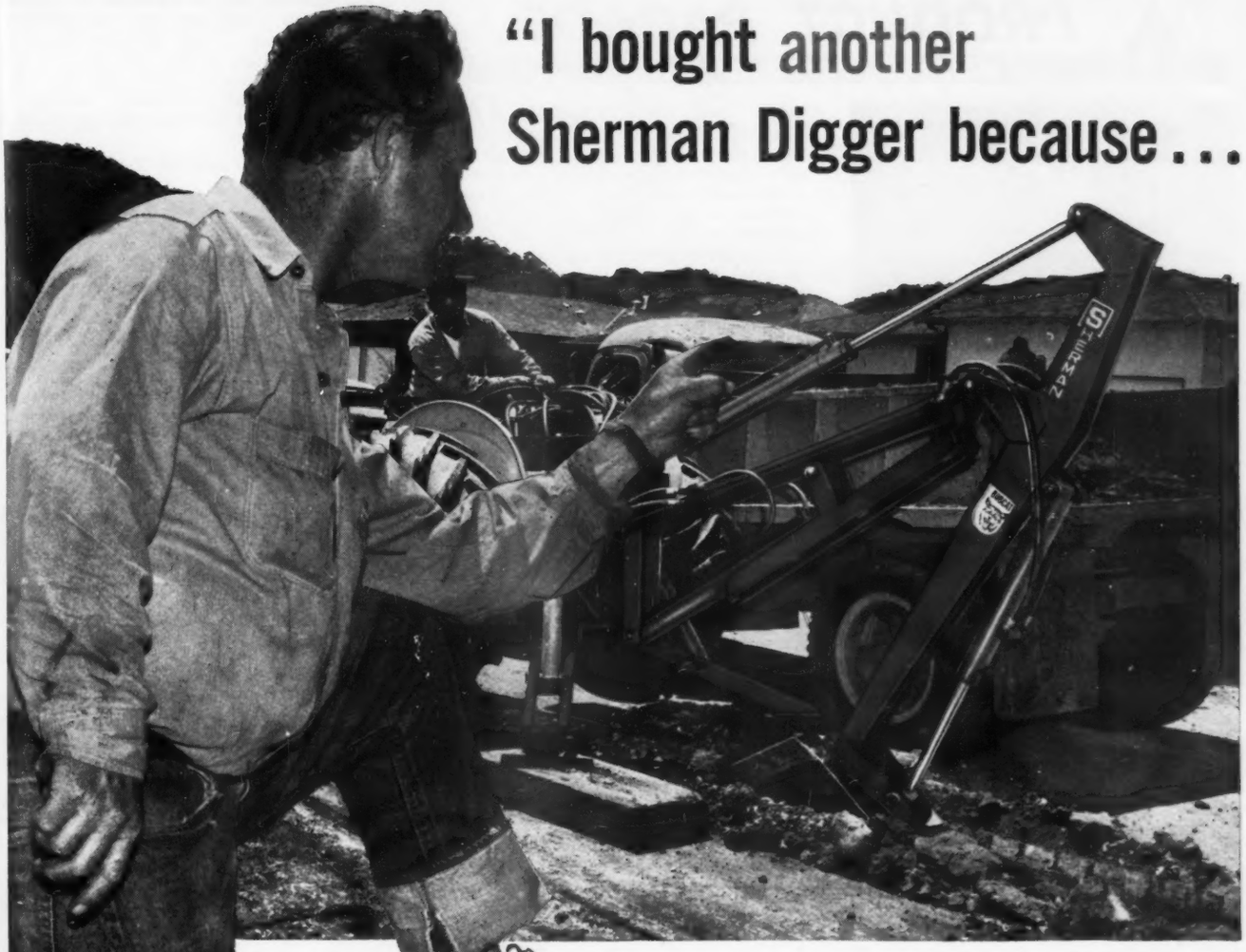
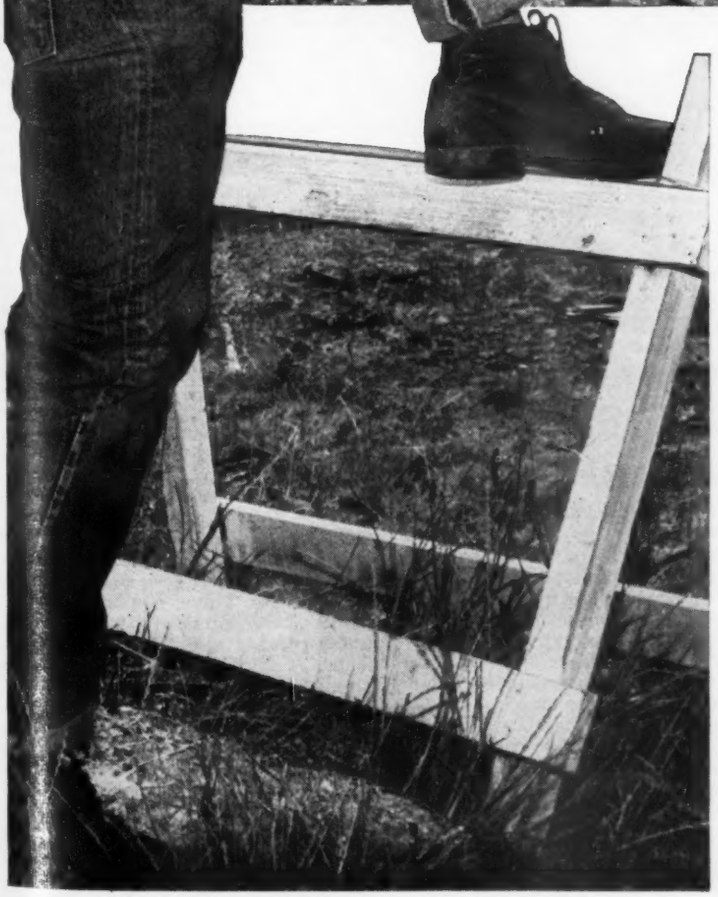
"I bought another Sherman Digger because...





...since 1953, when I got my first Sherman, I have owned a total of five. The power and maneuverability of the Sherman make it easy to adjust to extreme variances in soil and terrain. The self-equalizer stabilizers also help in this respect. Then, too, the Sherman is faster than competitive makes and service and parts are always available. The jobs I have done range all the way from digging a road up the side of a mountain to digging inside San Quentin prison for an electrical contractor. We like the Sherman because we know what we are getting!"

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PRODUCT PARADE

MATERIALS – EQUIPMENT – SERVICES

Epoxy corrosion protection can now be sprayed on pipe fittings, supports, and other related objects using Minnesota Mining and Manufacturing Co.'s "Scotchkote" brand protective resin—a one-part powdered 100 percent epoxy resin. The tough, thin coating gives pipe hardware physical and electrical protection of a true epoxy, and for the first time provides a practical means of applying corrosion protection to fittings prior to their arrival in the field. Recently available as a mill coating for pipe, Scotchkote can now be applied to fittings with portable, inexpensive equipment. Sprayed on heated parts with a flocking gun, the resin flows evenly to give a uniform smooth coating that cures in less than 60 seconds.

CIRCLE (1) ON THE REPLY CARD

New type gas detection instrument . . . developed by Detectogas Instruments Inc. . . . operates on a mechanical balance principle that allows it to work around the clock without power or an attendant. Explosion proof switches can activate any type of alarm system when changes in air density caused by gas accumulation occur. Unit automatically compensates for changes in temperature, humidity, and atmospheric pressure. Can be installed wherever an accumulation of industrial or heating gases could jeopardize human life and property. Texas Instruments, Inc., manufactures the device for Detectogas . . . Battelle Memorial Institute of Columbus, Ohio, was design and development consultant. Cost is said to be less than one-third of cost of existing automatic gas detection equipment. Literature available.

CIRCLE (2) ON THE REPLY CARD

Chart integrator . . . for interpretation of American strip charts and conventional round charts . . . is described in new bulletin. Integrator provides 3 values from single run . . . computes chart extension for differential and static pressure and also provides read-out values for average absolute static pressure and average differential pressure.

CIRCLE (3) ON THE REPLY CARD

Non-clogging ink supply cartridge that can be installed in less than 30 seconds on Hagan ring balance meter inking system is described in new 4-page bulletin. Cartridges slip into place, permit closed system that eliminates problems caused by dust, dirt, and moisture. Cartridges contain 3 to 4-month ink supply and are disposable. Standard equipment on all new Hagan meters widely used for recording, indicating, and controlling process variables such differential heads, flow, absolute pressures, etc.

CIRCLE (4) ON THE REPLY CARD

Free . . . wall chart of conversion factors . . . a reference table for engineers and other executives is available from Precision Equipment Co. Includes common conversions such as inches to centimeters or watts to hp as well as other conversions difficult to locate in reference manuals such as atmospheres to kgs/sq cm; cm/sec to miles/hr; or cu ft to liters.

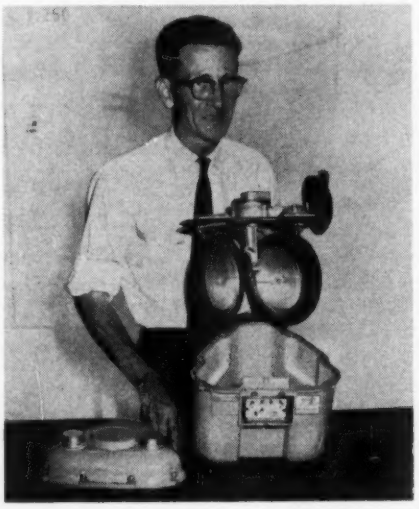
CIRCLE (5) ON THE REPLY CARD

Dozen major data processing systems controlled automatically by Friden business machines are described in new 28-page booklet. Handy reference guide . . . uses step-by-step illustrations and concise explanations of such applications as document writing, invoicing, code transmission, and data selection-readout. Shows how "building block concept" can be used . . . connecting various units to a "Flexowriter" for degree of automation demanded by system.

CIRCLE (6) ON THE REPLY CARD

Scientific gas venting . . . is described in 12-page comprehensive catalog of Metalbestos gas vent pipe and fittings just issued by William Wallace Co. Contains information on and specifications of Type "B" vent—RV round vent, QC round vent and WV oval vent. Discusses new integral spacers that make possible installation of 4-in. vent pipe in a 2 by 4 wall while maintaining safe clearance at all joints in pipe. Approximately 50 style combinations available for gas vent terminations are also discussed.

CIRCLE (7) ON THE REPLY CARD

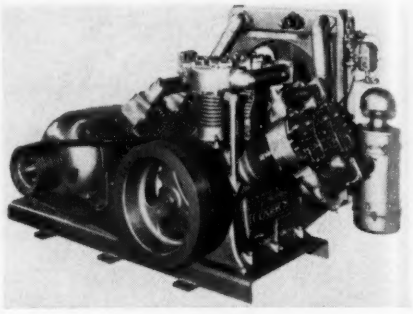


New gas meter by Arkla has unique V-shape that allows index to be included within the boundaries of the meter and permits easy access for adjustments. Meter has two bellows-type diaphragms located at 60 deg angles to each other that have a more direct drive to both the valve and index than those in other meter designs. All motions in the Arkla V-250 model are rotary except the diaphragms and connecting links. Weighs less and is smaller than any meter of same capacity —meter housing is of die cast aluminum. Dimensions are 11⅛ inches high; 10¾ inches wide at front and measures 8⅞ inches from front to rear. Literature available.

CIRCLE (8) ON THE REPLY CARD

Refrigerated storage facilities of liquefied petroleum gases can combine efficiency and economy . . . says new bulletin from Chicago Bridge & Iron Co. Typical storage methods are illustrated and described briefly . . . CB&I's "turnkey" service in construction of low temperature facilities is outlined.

CIRCLE (9) ON THE REPLY CARD



Clark's new line of 25 to 100 bhp air compressors are two-stage air cooled units designed for compactness, durability, and high efficiency. Complete air cooling eliminates need for cooling water duty as well as extra weight and expense of water jacketing. Units are light, compact, easy to install and easy to maintain. W-type construction shortens overall crankshaft and compressor length, thereby minimizing floor space requirements. Built in 25, 50, 75 and 100 bhp sizes, compressors are available as a basic compressor, base mounted compressor less motor, or complete base mounted package including electric motor drive.

CIRCLE (10) ON THE REPLY CARD

Truck cost record books and forms for driver daily reports. . . to assist truck users in evaluating performance of their equipment . . . are offered free of charge by motor truck division of International Harvester Co. Truck cost record book consisting of 20 pages, allows accurate record to be kept of all fixed, operating, and maintenance charges against one truck for a year. Driver daily report provides space for reporting number of trips, trip time, number of stops, mileage, fuel and oil consumption.

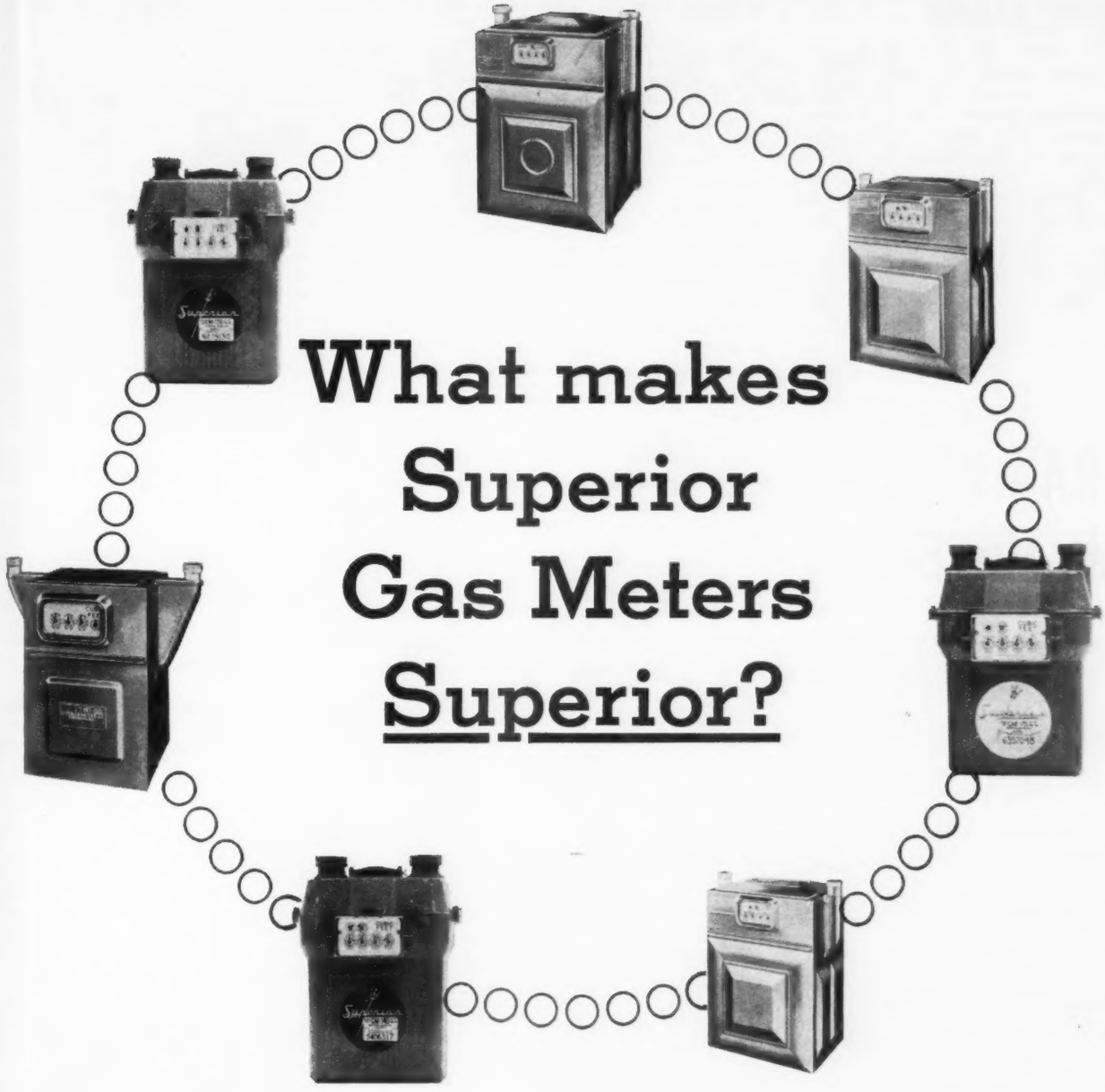
CIRCLE (11) ON THE REPLY CARD

Michigan tractor pipe handler is featured in new 4-page section of new catalog that describes complete line of Michigan construction and bulk materials handling equipment. Catalog contains descriptions and full-color illustrations of tractor shovels, dozers, scrapers, loggers, and excavator cranes. Full of new on-the-job photographs.

CIRCLE (12) ON THE REPLY CARD

Ductile Iron valves and fittings . . . in the 150 lb class . . . are described in new catalog from Stockham Valves & Fittings Co. of Birmingham. Valves combine strength, toughness, and impact resistance of steel and corrosion resistance of grey iron. Stockham's ductile iron valves are cast from modified cast iron valve patterns . . . offer wide variety of types and sizes including gate, globe, and swing check valves with accessories. Have wall thicknesses equal to or greater than those specified by API 600 for 150 lb steel valves; flange thicknesses conform to 150 lb standard in ASA B16.5 covering steel flange dimensions.

CIRCLE (13) ON THE REPLY CARD



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Expert craftsmanship, rigid inspections and top-notch design are combined to bring you better gas meters than ever before.

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PRODUCT PARADE

Improved version of Barton Instrument Corporation's Model 202 flow recorder that accurately measures and records static and differential pressure on a standard 12-in. round chart, features lower price than on the old 202, plus several design changes in the recorder case and linkages. Unit continues to use as its actuating unit the Barton rupture proof meter body. Unit is primarily intended for measurement of differential pressure but provision has been made for addition of two more pens for recording of temperature and static pressure. Available with either Barton or Foxboro time arc.

CIRCLE (14) ON THE REPLY CARD

Reliance regulator accessories are described in 2 new bulletins from American Meter Co. Details, features, and specifications of 5 vent caps are given in bulletin 172; weights, dimensions and bolt sizes for 24 sizes of venturi reducers and 40 sizes of companion flanges are given in bulletin 173.

CIRCLE (15) ON THE REPLY CARD

Dust Control product bulletin describes American Air Filter Co. complete line of dust control equipment including dry centrifugals, wet collectors, fabric collectors, and electrostatic precipitators. Explains and illustrates 13 different AAF products, capacities, and specific applications.

CIRCLE (16) ON THE REPLY CARD

STRAIGHT LINE PAN MOVEMENT

There's no chance for a diaphragm pan to start traveling in an arc when you install this improved Lancaster Carrier Wire Assembly.

SIDE CARRIER BRACKET **height can be quickly adjusted for most accurate positioning. No wire bending.**

OVAL SLOT CENTER BRACKET **permits diaphragm pan to travel straight through. No chance for wear.**

Oval slot center brackets available separately can be adapted to any carrier wire. Porous bronze and graphite bushings used throughout. Order now for easier installation and increased meter accuracy.

A meter is only as accurate as its parts . . . and Lancaster quality parts are guaranteed to outperform the original parts.

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Gas range combining burner units and oven in a floor-supported counter unit . . . just introduced by Caloric Appliance Corp. . . . offers advantages of built-in units but requires no supporting cabinets. Called the "Compacto," new ranges are 30-in. wide, available in black, white, coppertone, yellow, pink, or turquoise colors. Also available with Thermo-set top burners providing automatic temperature control.

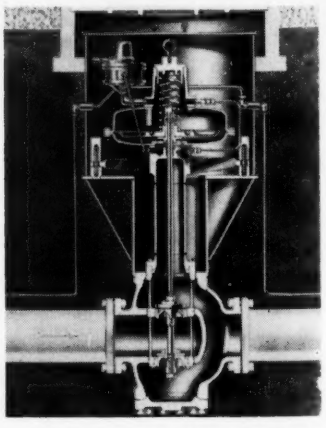
CIRCLE (17) ON THE REPLY CARD

Strip Chart recorder for flow, pressure, and temperature measurements . . is detailed in new bulletin from American Meter Co. Chart speeds are available from ½ to 6-in. per hour, providing a continuous record up to 36 days. Recorder can be powered by an electric drive or an American gasclok power drive.

CIRCLE (18) ON THE REPLY CARD

Pipe Fitters Manual . . . comprehensive 72-page handbook containing information expected to be at the finger tips of modern pipe fitters and pipe welders . . . is available from Tube Turns Division of Chemetron Corp. Extremely useful to distribution engineers, foremen, and servicemen. Text, tables, and illustrations in pocket-size field manual cover characteristics of welded and threaded piping; basic mathematical formulas and conversion factors; dimensions of welding fittings and flanges and commercial pipe sizes, and electrode data.

CIRCLE (19) ON THE REPLY CARD

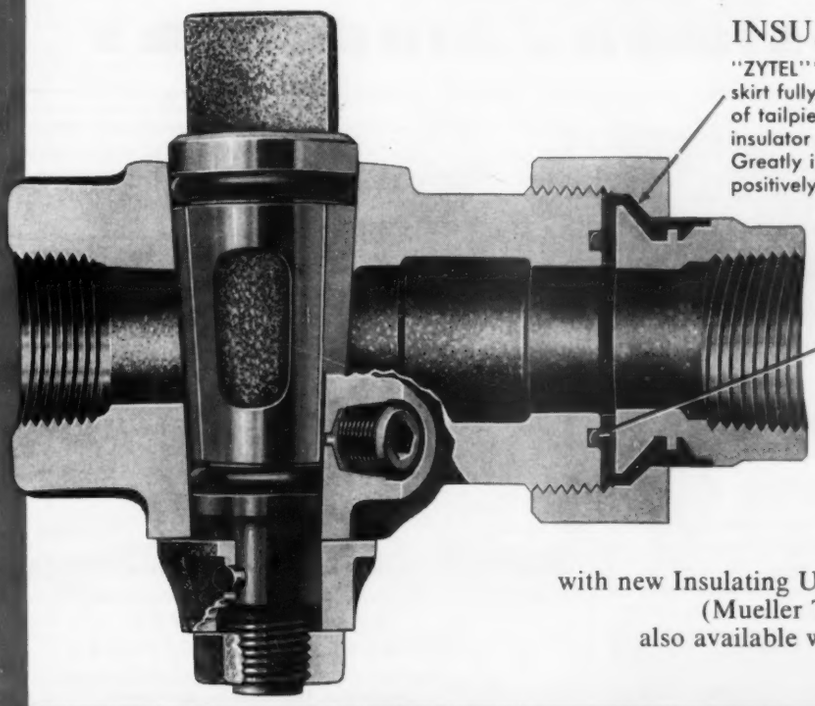


New regulator for pit installations . . . available from Fisher Governor Co. . . . is enclosed in cylindrical steel housing so entire unit can be buried in the ground; it's reinforced to protect against heaving effects of frozen earth. Valve body design has been modified so inner valve and actuator can be lifted from body for inspection or maintenance without disturbing body or piping. Length of valve stem and housing is varied as necessary to reach main depth. Valve body is cast steel, available in 6 by 4-in. size. Reduced pressure range is ¼ to 20 psi with 250 psi maximum inlet pressure.

CIRCLE (20) ON THE REPLY CARD

new from MUELLER®

insulating union gas meter stops



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"ZYTEL"* 105 insulator with extra-long skirt fully encloses face and flange of tailpiece. Unique bonding grooves lock insulator in place to reduce "creep". Greatly increased sealing surface positively prevents skirt leakage.

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By combining their service-proven gas meter stops with this new insulating union, Mueller Co. has provided a practical, easy-to-install and "foolproof" answer to service isolation problems.

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PRODUCT PARADE

Regular port valve for general service . . . ideally suited for use in flowlines, headers, or manifolds where large full opening valves are not essential . . . has been designed by Grove Valve and Regulator Co. Equipped with non-rising stem, valve is substantially smaller in overall height and width than conventional regular port valves. Available in 2-in. size with API 3000 lb and 5000 lb flanged, and ASA class 900 and 1500 flanged ratings.

CIRCLE (21) ON THE REPLY CARD

Low-cost insulating fill . . . called Perlox . . . for use with low temperature liquefied gas such as LNG, is described in 4-page brochure from Johns-Manville. Safety, effectiveness of Perlox, and its conductivity and physical properties are listed.

CIRCLE (22) ON THE REPLY CARD

Dreyfuss-designed Waste King Universal gas built-in ovens, ranges are now available. Production of the new gas built-ins, coupled with availability of undercounter dishwasher-dryers and food waste disposers, makes it possible to carry stylish Dreyfuss design throughout an entire kitchen for the first time. Outstanding feature of the new built-in oven is easy-to-use roast guide so simple even newest bride will be encouraged to use it. Other features include full-width, fiberglass-insulated oven doors; and double-stippled porcelain lining.

CIRCLE (23) ON THE REPLY CARD

* * *

Laundry Ad: "Don't kill your wife; let us do the dirty work."

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PRODUCT PARADE

Arkla-Humphrey's 1961 "Radiantfire" gas room circulators feature interchangeable gold or brown leather-grain front panels; top-mounted control; straight-line, near floor-level radiant heating; large warm-air top grille; full width radiant front and over-sized heat exchanger for maximum heating efficiency; and built-in draft diverter. Available in 30,000 to 70,000 Btu.

CIRCLE (24) ON THE REPLY CARD

Three Reliance valves are detailed in 3 new bulletins from American Meter Co. Reliance's automatic shut-off valve . . . designed for use on low-pressure distribution and service lines . . . is especially recommended for schools and public buildings. Another, the diaphragm-operated check valve is a safety device designed for use on oxygen-gas burning equipment such as jewelers' torches and radiator repair torches. Toggle-action relief valve . . . to safeguard consumer service on take-offs from high pressure transmission lines . . . is described in another bulletin. Installed between high pressure reducing regulator and house service regulator, toggle-action valves eliminates danger of high pressure reaching service regulator, meter, and house piping; maximum working pressure is 250 psi.

CIRCLE (25) ON THE REPLY CARD

Self-locking joint for all Normac couplings and fittings assures compression even when danger of possible pull-out exists. In addition to regular rubber gasket and retainer, declining recess in special nut contains stainless steel spiral ring that fits the recess and any outward pull of the pipe tends to roll the ring into the declining recess with increasing grip on the pipe. In tensile testing machine tests joint shows 8 to 30 times more resistance to pull out than standard compression joints. Available in ¾ to 2-in. sizes.

CIRCLE (26) ON THE REPLY CARD

Industrial Tractor Trailer . . . *Totem-All* . . . is described in new 4-page bulletin. Hitched to light pick-up truck, unit hauls small crawlers, tractors with front-end loaders, backhoes, scraper blades, trenchers or similar equipment to job site. Easy to load and unload . . . tested and cleared by John Deere Co. Single axle trailer has capacity of 6000 lb; tandem axle, 12,000 lb capacity; and triple axle, 17,000 capacity.

CIRCLE (27) ON THE REPLY CARD

* * *

The stenographer was going to have a baby. She wrote a resignation note to her boss: "Dear Boss: I am getting too big for this job . . ."— *Natural Gasser.*

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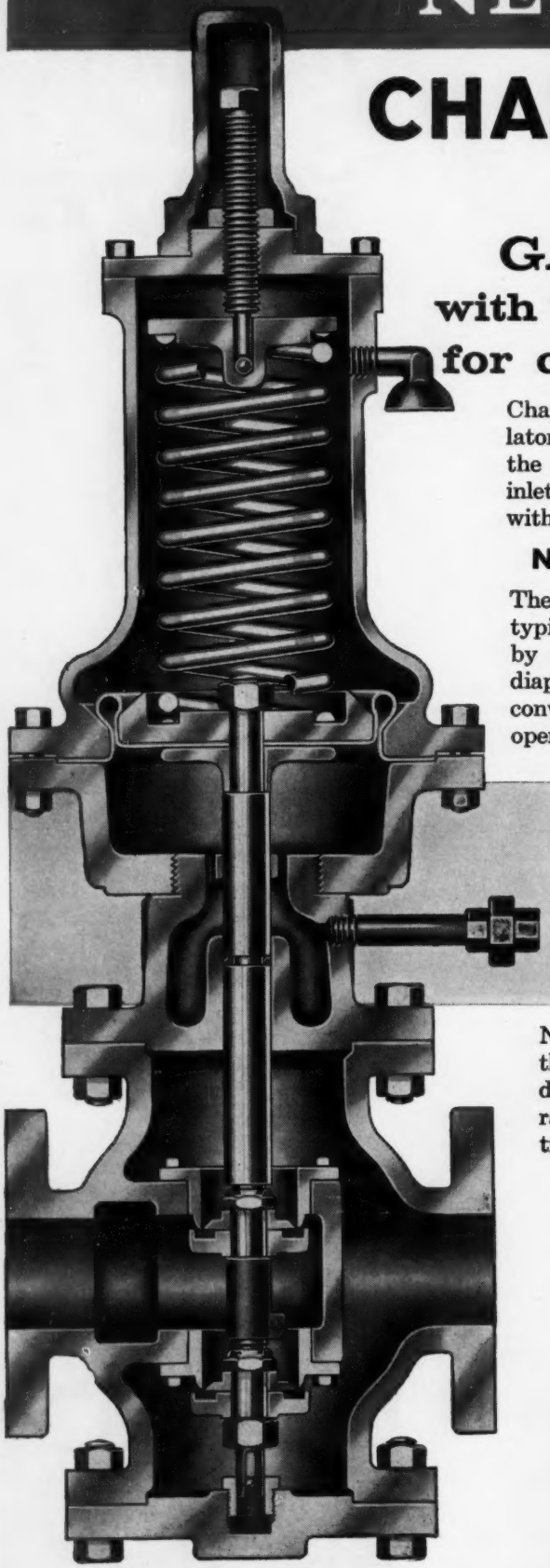


2" - 3" - 4" - 6"

Write for Bulletin 57-S

CHAPLIN-FULTON

Model 57-S

GAS REGULATOR

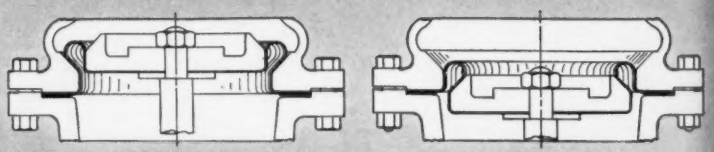
with "ROLL-OUT" Diaphragm for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

NO "FALL-OFF" AS FLOW INCREASES

The drooping characteristics or outlet pressure "fall-off", typical of conventional spring regulators, is eliminated—not by using an uncontrollable velocity effect—but by a new diaphragm design which actually reverses the action of a conventional diaphragm. It changes its area as the valve opens to compensate for the loss in spring loading force.

"ROLL-OUT" DIAPHRAGM PRINCIPLE



VALVE CLOSED VALVE OPEN

Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

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